Weston & Sampson SM

westonandsampson.com

55 Walkers Brook Drive, Suite 100
Reading, MA 01867
tel: 978.532.1900

Notice of Intent

March 2023

BELL POND PARK IMPROVEMENTS PROJECT

WORCESTER, MASSACHUSETTS

PREPARED FOR:
CITY OF WORCESTER
455 MAIN STREET
WORCESTER, MA 01608

SUBMITTED TO:
WORCESTER CONSERVATION COMMISSION
CITY HALL ROOM 404
455 MAIN STREET
WORCESTER, MA 01608

55 Walkers Brook Drive, Suite 100, Reading, MA 01867
Tel: 978.532.1900

March 22, 2023

Worcester Conservation Commission
Planning & Regulatory Services
455 Main Street, City Hall Room 404
Worcester, MA 01608

Re: Notice of Intent – Bell Pond Park Improvements Project in Worcester, Massachusetts

Dear Members of the Commission:

On behalf of the City of Worcester, Weston & Sampson Engineers, Inc. is submitting a Notice of Intent (NOI) to fulfill the requirements of the Massachusetts Wetlands Protection Act, M.G.L. Chapter 131, Section 40 submittal requirements and the City of Worcester submittal requirements. Three (3) hard copies including the plans (two full-size, one reduced size) were sent to the Conservation Commission office. An electronic copy has been emailed to planning@worcesterma.gov and the Central Regional DEP Office.

As part of the filing, we have attached the following:

WPA Form 3
Appendix A: Project Description
Appendix B: Stormwater Report
Appendix C: Maps
Appendix D: Specifications
Appendix E: Abutters Information
Appendix F: Wetlands Memorandum
Appendix G: Site Photographs
Appendix H: Permit Plans

If you have any questions regarding this submittal, please contact me at (978)-548-6301.

Very truly yours,

Megan Kearns, PWS
Environmental Scientist

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

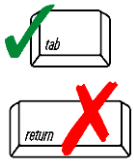
Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Worcester
City/Town

Important:
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



Note:
Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

A. General Information

1. Project Location (**Note:** electronic filers will click on button to locate project site):

190 and 238 Belmont Street — a. Street Address
Worcester — b. City/Town
01608 — c. Zip Code

Latitude and Longitude:
42.272503 — d. Latitude
-71.785203 — e. Longitude

Map 16 — f. Assessors Map/Plat Number
Parcels 036-00004 and 015-0009A — g. Parcel /Lot Number

2. Applicant:

Robert — a. First Name
Antonelli — b. Last Name
City of Worcester Department of Public Works and Parks — c. Organization
20 East Worcester Street — d. Street Address
Worcester — e. City/Town
MA — f. State
01604 — g. Zip Code
508-929-1300 — h. Phone Number
i. Fax Number
dpw@worcesterma.gov — j. Email Address

3. Property owner (required if different from applicant): ☐ Check if more than one owner

a. First Name
b. Last Name
c. Organization
d. Street Address
e. City/Town
f. State
g. Zip Code
h. Phone Number
i. Fax Number
j. Email address

4. Representative (if any):

Megan — a. First Name
Kearns — b. Last Name
Weston & Sampson Engineers — c. Company
55 Walkers Brook Drive, Suite 100 — d. Street Address
Reading — e. City/Town
MA — f. State
01867 — g. Zip Code
978-548-6301 — h. Phone Number
i. Fax Number
kearns.megan@wseinc.com — j. Email address

5. Total WPA Fee Paid (from NOI Wetland Fee Transmittal Form):

Fee exempt — a. Total Fee Paid
Fee exempt — b. State Fee Paid
Fee exempt — c. City/Town Fee Paid

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Worcester
City/Town

A. General Information (continued)

6. General Project Description:

The City of Worcester is proposing upgrades to the existing Bell Hill Park located on Belmont Street in Worcester, Massachusetts. See Appendix A, Project Description, for additional information.

7a. Project Type Checklist: (Limited Project Types see Section A. 7b.)

1. ☐ Single Family Home
2. ☐ Residential Subdivision
3. ☐ Commercial/Industrial
4. ☐ Dock/Pier
5. ☐ Utilities
6. ☐ Coastal engineering Structure
7. ☐ Agriculture (e.g., cranberries, forestry)
8. ☐ Transportation
9. ☒ Other

7b. Is any portion of the proposed activity eligible to be treated as a limited project (including Ecological Restoration Limited Project) subject to 310 CMR 10.24 (coastal) or 310 CMR 10.53 (inland)?

1. ☐ Yes ☒ No

If yes, describe which limited project applies to this project. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)

2. Limited Project Type

If the proposed activity is eligible to be treated as an Ecological Restoration Limited Project (310 CMR10.24(8), 310 CMR 10.53(4)), complete and attach Appendix A: Ecological Restoration Limited Project Checklist and Signed Certification.

8. Property recorded at the Registry of Deeds for:

a. County	b. Certificate # (if registered land)
Worcester	
c. Book	d. Page Number
1307	647

B. Buffer Zone & Resource Area Impacts (temporary & permanent)

1. ☒ Buffer Zone Only – Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.
2. ☐ Inland Resource Areas (see 310 CMR 10.54-10.58; if not applicable, go to Section B.3, Coastal Resource Areas).

Check all that apply below. Attach narrative and any supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Worcester
City/Town

B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

For all projects affecting other Resource Areas, please attach a narrative explaining how the resource area was delineated.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Bank	1. linear feet	2. linear feet
b. ☐ Bordering Vegetated Wetland	1. square feet	2. square feet
c. ☐ Land Under Waterbodies and Waterways	1. square feet 3. cubic yards dredged	2. square feet

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. ☐ Bordering Land Subject to Flooding	1. square feet	2. square feet
	3. cubic feet of flood storage lost	4. cubic feet replaced
e. ☐ Isolated Land Subject to Flooding	1. square feet	
	2. cubic feet of flood storage lost	3. cubic feet replaced

f. ☐ Riverfront Area

1. Name of Waterway (if available) - **specify coastal or inland**

2. Width of Riverfront Area (check one):

☐ 25 ft. - Designated Densely Developed Areas only

☐ 100 ft. - New agricultural projects only

☐ 200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project: _____ square feet

4. Proposed alteration of the Riverfront Area:

a. total square feet _____ b. square feet within 100 ft. _____ c. square feet between 100 ft. and 200 ft. _____

5. Has an alternatives analysis been done and is it attached to this NOI? ☐ Yes ☐ No

6. Was the lot where the activity is proposed created prior to August 1, 1996? ☐ Yes ☐ No

3. ☐ Coastal Resource Areas: (See 310 CMR 10.25-10.35)

Note: for coastal riverfront areas, please complete **Section B.2.f**. above.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Worcester
City/Town

B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

Check all that apply below. Attach narrative and supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. ☐ Land Under the Ocean	1. square feet 2. cubic yards dredged	
c. ☐ Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. ☐ Coastal Beaches	1. square feet	2. cubic yards beach nourishment
e. ☐ Coastal Dunes	1. square feet	2. cubic yards dune nourishment

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
f. ☐ Coastal Banks	1. linear feet	
g. ☐ Rocky Intertidal Shores	1. square feet	
h. ☐ Salt Marshes	1. square feet	2. sq ft restoration, rehab., creation
i. ☐ Land Under Salt Ponds	1. square feet 2. cubic yards dredged	
j. ☐ Land Containing Shellfish	1. square feet	
k. ☐ Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above 1. cubic yards dredged	
l. ☐ Land Subject to Coastal Storm Flowage	1. square feet	

4. ☐ Restoration/Enhancement

If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.2.b or B.3.h above, please enter the additional amount here.

a. square feet of BVW

b. square feet of Salt Marsh

5. ☐ Project Involves Stream Crossings

a. number of new stream crossings

b. number of replacement stream crossings

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 3 – Notice of Intent
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File Number
Document Transaction Number
Worcester
City/Town

C. Other Applicable Standards and Requirements

☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section C and complete Appendix A: Ecological Restoration Limited Project Checklists – Required Actions (310 CMR 10.11).

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

1. Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to http://maps.massgis.state.ma.us/PRI_EST_HAB/viewer.htm.

   a. ☐ Yes ☒ No

   If yes, include proof of mailing or hand delivery of NOI to:

   Natural Heritage and Endangered Species Program
   Division of Fisheries and Wildlife
   1 Rabbit Hill Road
   Westborough, MA 01581

   2021
   b. Date of map

   If *yes*, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18). To qualify for a streamlined, 30-day, MESA/Wetlands Protection Act review, please complete Section C.1.c, and include requested materials with this Notice of Intent (NOI); *OR* complete Section C.2.f, if applicable. *If MESA supplemental information is not included with the NOI, by completing Section 1 of this form, the NHESP will require a separate MESA filing which may take up to 90 days to review (unless noted exceptions in Section 2 apply, see below).*

   c. Submit Supplemental Information for Endangered Species Review*

      1. ☐ Percentage/acreage of property to be altered:

         (a) within wetland Resource Area _____ percentage/acreage

         (b) outside Resource Area _____ percentage/acreage

      2. ☐ Assessor's Map or right-of-way plan of site

2. ☐ Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work **

   (a) ☐ Project description (including description of impacts outside of wetland resource area & buffer zone)

   (b) ☐ Photographs representative of the site

* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see https://www.mass.gov/ma-endangered-species-act-mesa-regulatory-review).
Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.
** MESA projects may not be segmented (321 CMR 10.16). The applicant must disclose full development plans even if such plans are not required as part of the Notice of Intent process.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 3 – Notice of Intent
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File Number
Document Transaction Number
Worcester
City/Town

C. Other Applicable Standards and Requirements (cont'd)

(c) ☐ MESA filing fee (fee information available at https://www.mass.gov/how-to/how-to-file-for-a-mesa-project-review).
Make check payable to "Commonwealth of Massachusetts - NHESP" and ***mail to NHESP*** at above address

*Projects altering **10 or more acres** of land, also submit:*

(d) ☐ Vegetation cover type map of site

(e) ☐ Project plans showing Priority & Estimated Habitat boundaries

(f) OR Check One of the Following

1. ☐ Project is exempt from MESA review.
Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, https://www.mass.gov/service-details/exemptions-from-review-for-projectsactivities-in-priority-habitat; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)

2. ☐ Separate MESA review ongoing. a. NHESP Tracking # b. Date submitted to NHESP

3. ☐ Separate MESA review completed.
Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

3. For coastal projects only, is any portion of the proposed project located below the mean high water line or in a fish run?

a. ☒ Not applicable – project is in inland resource area only b. ☐ Yes ☐ No

If yes, include proof of mailing, hand delivery, or electronic delivery of NOI to either:

South Shore - Cohasset to Rhode Island border, and the Cape & Islands:

Division of Marine Fisheries -
Southeast Marine Fisheries Station
Attn: Environmental Reviewer
836 South Rodney French Blvd.
New Bedford, MA 02744
Email: dmf.envreview-south@mass.gov

North Shore - Hull to New Hampshire border:

Division of Marine Fisheries -
North Shore Office
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930
Email: dmf.envreview-north@mass.gov

Also if yes, the project may require a Chapter 91 license. For coastal towns in the Northeast Region, please contact MassDEP's Boston Office. For coastal towns in the Southeast Region, please contact MassDEP's Southeast Regional Office.

c. ☐ Is this an aquaculture project? d. ☐ Yes ☒ No

If yes, include a copy of the Division of Marine Fisheries Certification Letter (M.G.L. c. 130, § 57).

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Worcester
City/Town

C. Other Applicable Standards and Requirements (cont'd)

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

4. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?

   a. ☐ Yes ☒ No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.

   b. ACEC

5. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?

   a. ☐ Yes ☒ No

6. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, § 105)?

   a. ☐ Yes ☒ No

7. Is this project subject to provisions of the MassDEP Stormwater Management Standards?

   a. ☒ Yes. Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:

      1. ☐ Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol. 2, Chapter 3)

      2. ☒ A portion of the site constitutes redevelopment

      3. ☒ Proprietary BMPs are included in the Stormwater Management System.

   b. ☐ No. Check why the project is exempt:

      1. ☐ Single-family house

      2. ☐ Emergency road repair

      3. ☐ Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

D. Additional Information

☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section D and complete Appendix A: Ecological Restoration Notice of Intent – Minimum Required Documents (310 CMR 10.12).

Applicants must include the following with this Notice of Intent (NOI). See instructions for details.

Online Users: Attach the document transaction number (provided on your receipt page) for any of the following information you submit to the Department.

1. ☒ USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)

2. ☒ Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Worcester
City/Town

D. Additional Information (cont'd)

3. ☒ Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.), and attach documentation of the methodology.

4. ☒ List the titles and dates for all plans and other materials submitted with this NOI.

Bell Pond Improvements
a. Plan Title

Weston & Sampson Engineers
b. Prepared By

Brandon Kunkel
c. Signed and Stamped by

March 22, 2023
d. Final Revision Date

1"=20'
e. Scale

f. Additional Plan or Document Title

g. Date

5. ☐ If there is more than one property owner, please attach a list of these property owners not listed on this form.

6. ☐ Attach proof of mailing for Natural Heritage and Endangered Species Program, if needed.

7. ☐ Attach proof of mailing for Massachusetts Division of Marine Fisheries, if needed.

8. ☒ Attach NOI Wetland Fee Transmittal Form

9. ☒ Attach Stormwater Report, if needed.

E. Fees

1. ☒ Fee Exempt: No filing fee shall be assessed for projects of any city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority, municipal housing authority, or the Massachusetts Bay Transportation Authority.

Applicants must submit the following information (in addition to pages 1 and 2 of the NOI Wetland Fee Transmittal Form) to confirm fee payment:

Fee exempt
2. Municipal Check Number

3. Check date

4. State Check Number

5. Check date

6. Payor name on check: First Name

7. Payor name on check: Last Name

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 3 – Notice of Intent
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File Number
Document Transaction Number
Worcester
City/Town

F. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Notice of Intent and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge. I understand that the Conservation Commission will place notification of this Notice in a local newspaper at the expense of the applicant in accordance with the wetlands regulations, 310 CMR 10.05(5)(a).

I further certify under penalties of perjury that all abutters were notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. Notice must be made by Certificate of Mailing or in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

1. Signature of Applicant

2. Date 3/15/23

3. Signature of Property Owner (if different)

4. Date

Megan Keane

5. Signature of Representative (if any)

6. Date 3/21/2023

For Conservation Commission:
Two copies of the completed Notice of Intent (Form 3), including supporting plans and documents, two copies of the NOI Wetland Fee Transmittal Form, and the city/town fee payment, to the Conservation Commission by certified mail or hand delivery.

For MassDEP:
One copy of the completed Notice of Intent (Form 3), including supporting plans and documents, one copy of the NOI Wetland Fee Transmittal Form, and a **copy** of the state fee payment to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery.

Other:
If the applicant has checked the "yes" box in any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

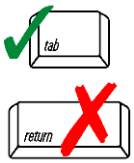
The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

NOI Wetland Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A. Applicant Information

1. Location of Project:

190 and 238 Belmont Street	Worcester
a. Street Address	b. City/Town
Fee exempt	Fee exempt
c. Check number	d. Fee amount

2. Applicant Mailing Address:

Robert		Antonelli
a. First Name		b. Last Name

City of Worcester Department of Public Works and PArks
c. Organization

20 East Worcester Street
d. Mailing Address

Worcester	MA	01604
e. City/Town	f. State	g. Zip Code

508-929-1300		dpw@worcesterma.gov
h. Phone Number	i. Fax Number	j. Email Address

3. Property Owner (if different):

a. First Name	b. Last Name

c. Organization

d. Mailing Address

e. City/Town	f. State	g. Zip Code

h. Phone Number	i. Fax Number	j. Email Address

B. Fees

To calculate filing fees, refer to the category fee list and examples in the instructions for filling out WPA Form 3 (Notice of Intent).

Fee should be calculated using the following process & worksheet. ***Please see Instructions before filling out worksheet.***

Step 1/Type of Activity: Describe each type of activity that will occur in wetland resource area and buffer zone.

Step 2/Number of Activities: Identify the number of each type of activity.

Step 3/Individual Activity Fee: Identify each activity fee from the six project categories listed in the instructions.

Step 4/Subtotal Activity Fee: Multiply the number of activities (identified in Step 2) times the fee per category (identified in Step 3) to reach a subtotal fee amount. Note: If any of these activities are in a Riverfront Area in addition to another Resource Area or the Buffer Zone, the fee per activity should be multiplied by 1.5 and then added to the subtotal amount.

Step 5/Total Project Fee: Determine the total project fee by adding the subtotal amounts from Step 4.

Step 6/Fee Payments: To calculate the state share of the fee, divide the total fee in half and subtract $12.50. To calculate the city/town share of the fee, divide the total fee in half and add $12.50.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

NOI Wetland Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Fees (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee
Fee exempt			

Step 5/Total Project Fee: _____

Step 6/Fee Payments:

Total Project Fee: _____ a. Total Fee from Step 5

State share of filing Fee: _____ b. 1/2 Total Fee **less $**12.50

City/Town share of filling Fee: _____ c. 1/2 Total Fee **plus** $12.50

C. Submittal Requirements

a.) Complete pages 1 and 2 and send with a check or money order for the state share of the fee, payable to the Commonwealth of Massachusetts.

Department of Environmental Protection
Box 4062
Boston, MA 02211

b.) **To the Conservation Commission:** Send the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and the city/town fee payment.

To MassDEP Regional Office (see Instructions): Send a copy of the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and a **copy** of the state fee payment. (E-filers of Notices of Intent may submit these electronically.)

APPENDIX A

PROJECT DESCRIPTION

Background

The City of Worcester is proposing to improve the existing Bell Hill Park, located at 190 and 238 Belmont Street in Worcester, Massachusetts (See Appendix C, Locus Map). The project will provide new and updated facilities and park amenities.

Site Description

Bell Hill Park is bordered to the north by Belmont Street (Route 9), Belmont Street Community School to the west, undeveloped woods to the south, and Sudbury Heights Apartment Complex to the east.

Wetland resource areas observed on site include Bordering Vegetated Wetlands (BVW), Inland Bank (Bank), and the 100-foot Buffer Zone to BVW and Bank. In addition to these areas protected under the Wetlands Protection Act (WPA), the local Worcester Wetland Ordinance resource areas observed on site in addition to those identified above include the 15-foot, 30-foot, and 50-foot Buffer Zones to BVW and Bank, and the 100-foot Stormwater Protection Zone (SPZ).

Scope of Work

The project proposes the following improvements to the park:

- Parking lot refurbishment, including grading, drainage and lighting upgrades;
- Renovation of existing building with no changes to the footprint;
- New playground equipment and surfacing with new seating benches;
- New enlarged basketball court;
- New paved paths to provide an accessible route to the beach where previously there was none;
- New paved plaza at the beach to improve accessibility;
- Beach replenishment above the Top of Bank elevation;
- New pedestrian lighting with new security camera system;
- A new shade structure for two picnic tables and two new additional picnic tables;
- New gravel access route for maintenance vehicles up to Chandler Hill Park with access through the parking lot to replace the existing access road that lacks a curb cut on Belmont Street;
- Extensive tree planting throughout the site; and,
- Other elements as integral to the project design program.

The project will demolish all existing paving including the basketball court, and strip and stockpile the top 6 inches of soil. The footprint of the basketball court will be expanded to create a full-size court. A concrete retaining wall will be poured in place to create the level court surface. This wall will necessitate the removal and revegetation of a section of the existing gravel access drive. A new drive will be cleared and graded along the south side of the basketball court that will connect to the existing gravel drive farther up the slope. The

edges of the new drive will be replanted with trees and seeded with a shade-tolerant grass mix.

The existing playground equipment, surfacing and fencing will be demolished and replaced with a larger play space with new equipment, surfacing, seating and fencing. To expand the playground footprint, the existing slope to the south will be excavated to allow for a new concrete retaining wall to be poured in place to retain grade.

A new concrete plaza will be poured in place around the existing building as part of the accessibility improvements with new poured in place concrete paths extending down to a shade trellis with benches and a new seating area for lounge chairs, and then the path extends down farther to the beach. At the beach, the existing retaining wall will be demolished and a new poured in place concrete retaining wall will be constructed to replace it. A small concrete paved area will be constructed to provide an accessible surface adjacent to the beach. Grasspave or a similar product will be installed along both sides of the concrete path down to the beach to allow truck access down to the beach for maintenance purposes. The slope of the paths was kept below 5% to avoid having handrails which would have prohibited truck access.

A new poured in place concrete path will be constructed from the new plaza at the existing building extending southeast to replace an existing path connecting to an existing footpath that runs around the pond.

There is a stone retaining wall that borders a wetland. Sections of this wall have fallen into the BVW, and the project proposes to repair this wall by hand to prevent soil from washing into the BVW.

Environmental Considerations

The proposed project will include impacts the 100-foot Buffer Zone associated with the wetlands and bank of Bell Pond. No permanent impacts are proposed to BVW or Bank. Invasive species removal by hand pulling will occur in BVW (2,585 square feet). After discussion with the conservation agent, it was determined that this work would not be considered a permanent impact to BVW. No heavy machinery will be used in the wetlands.

Work activities proposed in the 15-foot Buffer Zone include an updated retaining wall, trail resurfacing and sand resurfacing on the beach. Activities proposed within the 30-foot Buffer Zone include the updated retaining wall, trail resurfacing, grading and sand resurfacing on the beach. Activities proposed in the 50-foot Buffer Zone include trail resurfacing, grading, sand resurfacing on the beach, and the removal of one tree (28-inch Elm).

Lastly, work activities proposed within the Stormwater Protection Zone Work include: clearing and grubbing the existing slope, regrading and installing the proposed gravel access drive; removal of the existing fence and paving at the basketball court, excavation for the proposed retaining wall for the proposed expanded basketball court, filling against the wall to create a level surface for the court, and installation of new bituminous paving and new fencing and gates; removal of curbs and paving at parking lot; removal of three catch basins in and around the parking lot; regrading of parking lot and new catch basins,

curbs, paving, and wood vehicular guardrail installed; excavation and installation of a unit block retaining wall between the parking lot and Belmont Street; installation of concrete paving for paths and seating areas; excavation and installation of footings for a shade trellis; installation of loam and seed around new paved areas; and extensive tree plantings throughout the site.

A summary of impacts to wetland resource areas is provided in Table 1.

Table 1 – Summary of Wetland Resource Area Impacts

Wetland Resource Area	Proposed Impact
100-foot Buffer Zone	27,680 square feet
100-foot Stormwater Protection Zone (SPZ)	48,942 square feet
Worcester Bylaw 50-foot Buffer Zone	12,474 square feet
Worcester Bylaw 30-foot Buffer Zone	6,492 square feet
Worcester Bylaw 15-foot Buffer Zone	2,691 square feet

The proposed project will increase the amount of impervious surface located on the entire site. Currently, the site consists of 34,580 square feet of impervious surface. As part of the project, total impervious surface will increase to 42,020 square feet (net increase of 7,440 square feet). Specifically, within the 100-foot Buffer Zone to Bank, there will be a net increase in impervious surface of 4,214 square feet. Within the 100-foot SPZ, there will be a net increase of 4,402 square feet of impervious surface. Stormwater BMPs have been designed to treat the additional surface runoff for the additional impervious area.

Activities within the Buffer Zones

The following general performance standards are listed in the Worcester Wetland Bylaw for work within the 15-foot, 30-foot and 50-foot Buffer Zones. Compliance with these performance standards is outlined below.

A. *Structures and Improvements to Land – Except as may be allowed, no permanent or temporary foundation, building, road, sidewalk, bridge, sign, billboard or others permanent or temporary structure shall be placed within 30 feet of any resource area, unless,*
   1. *It is a component of a qualified limited project under the state Wetlands Protection Act and the regulations promulgated pursuant thereto; or*
   2. *It is a component of any storm water, flood control, water conservation, erosion control or soil conservation project otherwise approved.*

The project does not meet this standard, as small portions of accessible paved sidewalks and the updated retaining wall are proposed within the 30-foot Buffer Zone. In order to keep the slope under 5%, the length of the path is required. The applicant is requesting a waiver from this standard from the Commission.

B. *Construction Activities – Except as may be allowed below, no grading, filling, excavation, removal of vegetation or other construction activity (hereinafter, collectively the work) shall be allowed within fifteen feet (15') of any resource area, unless,*
   1. *The work is required to provide access to a resource area where a discretionary taking has been allowed under section 4.1 of these regulations; or*
   2. *The work is a component of any of the activities cited in (1) or (2) of subsection (A), above.*

The project does not meet this standard. The existing footpath sits within the 15-foot Buffer Zone for BVW-B and Top of Bank, so the proposed concrete path will also sit within the 15-foot and 30-foot Buffer Zones where it connects to the footpath. The alignment of the proposed path was shifted as much as feasible to remain outside of the 30-foot and 15-foot Buffer Zones until the end of the path where it connects to the footpath. The retaining wall and beach replenishment is proposed inside the 15-foot Buffer Zone to Bank. The applicant is also proposing to replace the existing deteriorating retaining wall adjacent to BVW B, which is located within the 15-foot Buffer Zone. These park upgrades are necessary, and the applicant is requesting a waiver from this standard from the Commission.

C. *Discretionary Allowances – The structures, Improvements and Work otherwise prohibited under subsections (A) and (B) above, may be allowed by the Conservation Commission if the applicant demonstrates and the Commission finds:*
   1. *Alternatives to the applicant's proposal have been considered, and no reasonable alternative is available; and*

The applicant is proposing to install accessibility down to the beach where there currently is none. The proposed project will not impact wetland resource areas. This is a public service project that will benefit the community.

   2. *The project scope and design minimize work in close proximity to any resource area; and*

The project design and scope minimized to the extent practicable work in proximity to wetland resource areas, as noted in C.1 above. No work is proposed in BVW or Bank.

   3. *The particular site conditions (including, but not limited to slope, soil type, and hydrology) will allow prevention of wetlands damage from such work; and*

The wetlands shall not be damaged as a result of the project, as no work is proposed in BVW except for hand pulling of invasive species. In fact, the BVW will be enhanced through the removal of invasive species.

4. *The work will not lead to further encroachments on the resource area after completion of the project; and*

The project will provide access down to the beach area for the community. New sidewalks will be installed closer to the wetland resource areas than currently exist. No impacts to wetland resource areas will occur.

5. *(A) The structure, improvement or activity is a component of any project to provide public access to and within the resource area after completion of the project; or*
   (B) The permitted activity will not materially impair significant conservation interests and is consistent with the interests and purpose of the wetlands protection ordinance.

The park improvements will provide public access to the beach and adjacent to the wetland resource area, and therefore will not impair significant conservation interests of the wetlands protection ordinance. The project will remove invasive species, specifically purple loosestrife (*Lythrum salicaria*) within BVW B, which will be an ecological improvement to the site. The applicant requests the Commission issue a waiver for the work proposed in the 15-foot and 30-foot Buffer Zones.

Stormwater Protection Zone (SPZ)

The City of Worcester protects lands within 100 feet of any existing or proposed inlet to any storm drain, catch basin or storm drain system component discharging to any lake, pond, river, stream or wetland. The proposed project is located within the 100-foot Buffer Zone to three (3) stormwater catch basins located within the park. A total of 48,942 square feet of work is proposed in the 100-foot SPZ, including updating and expanding the existing basketball court, resurfacing the parking lot, and other site improvements. Compliance with the general performance standards for work in the SPZ is outlined below.

(a) *Erosion and sediment controls must be provided according to a plan conforming to the provisions of section 3.2 herein and approved by the Conservation Commission.*

Erosion and sediment controls are proposed in all existing catch basins within the limit of work, and are shown in Appendix H, Permit Plans. Erosion controls will be installed between the park and the roadway to prevent sediment from migrating into the catch basins. In addition, a stabilized construction entrance will be installed to minimize the amount of sediment being tracked out onto the roadway. The erosion controls shall remain in place for the duration of construction and will be monitored and cleaned as needed.

(b) *The general performance of erosion controls shall be considered adequate if there is no visibly silted effluent entering the stormwater system;*

The applicant shall inspect erosion controls at the end of each day to remove buildup of any sediment and monitor that no visibly silted effluent is entering the stormwater system. For additional information, please refer to Appendix B, Stormwater Report.

(c) For projects resulting in the conversion of five thousand (5,000) square feet or more of pervious surface to impervious surface, measures shall be provided to mitigate peak rates of runoff and minimize discharge of pollutants to the stormwater system.

The proposed project will change 4,214 square feet (less than 5,000 square feet) of pervious surface to impervious surface within the SPZ, and 7,440 square feet of pervious to impervious surface on the site as a whole as a result of the park improvements. See Appendix B, Stormwater Report, for measures taken to mitigate peak rates of runoff and minimize discharge of pollutants to the stormwater system.

Conclusion

The information contained in this NOI and supporting documentation describes the project area, proposed work, and compliance with the applicable state and local performance standards. The Applicant therefore respectfully requests that the Commission issue an Order of Conditions approving the Project with appropriate conditions to protect the interests of the Act (M.G.L. c. 121, §40) and a waiver for work in the 15-foot and 30-foot Buffer Zones under the City of Worcester Wetlands Protection Ordinance and Wetlands Protection Regulations.

APPENDIX B

Stormwater Report

Worcester, Massachusetts

Bell Pond Improvements

March 22, 2023

JOB NO: ENG22-0194

Weston & Sampson
55 Walkers Brook Drive, Suite 100
Reading, MA 01867
www.westonandsampson.com
Tel: 978-532-1900 Fax: 978-977-0100

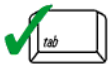
Table of Contents

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

---

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

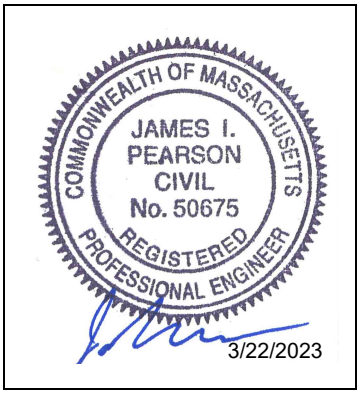
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



3/20/2023

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☐ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☒ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

---

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☒ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☒ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

Stormwater Report Summary

March 22, 2023

Applicant/Project Name: City of Worcester
Bell Pond Improvements

Project Address: 196 Belmont Street, Worcester, MA

Application Prepared by:
Firm: Weston & Sampson, Inc.
Registered PE: James Pearson, PE

The proposed project is subject to both the requirements of Standards 1-10 of the MassDEP Stormwater Handbook, and the Wetlands Protection Ordinance (WPO) of the City of Worcester. These regulations established a Stormwater Protection Zone (SPZ) within the City of Worcester, defined as "all land within 100-FT of an existing or proposed inlet to any storm drain, catch basin, or storm drain system component discharging into any lake, pond, river, stream, or wetland". Development activities that fall within the SPZ are required to meet the performance standards in Section 4.3 of the City of Worcester WPO.

Below is an explanation regarding the standards of Section 4.3 of the City of Worcester WPO and MassDEP Standards 1-10 as they apply to the Tacoma Playground Improvements project:

Project Information

The project applicant, the City of Worcester, proposes to redevelop the Bell Hill Park located at Bell Pond. Bell Hill Park is an existing park and public beach with a basketball court, playground, public restrooms and a parking lot. The City proposes to redevelop the facility in kind, with a new court, playground and parking lot, along with improved beach amenities including shade structures and pavilion areas. Additional work will include grading, landscaping and new drainage infrastructure.

Existing topography across the site varies, with the upper portion of the park facility (which includes the playing court, parking lot, playground, and restrooms) ranging from a high elevation of 675-FT± to a low of 673-FT±, while the lower portion of the facility (beach area) ranges from 668-FT± to 665-FT±. The park and beach sit adjacent to Bell Pond and the site includes two areas of bordering vegetated wetlands along the shoreline of Bell Pond. The drainage infrastructure in the existing parking lot consists of several catch basins which collect runoff and discharge directly into drainage infrastructure located in Belmont Street.

NRCS soil mapping describes the site as being comprised of Paxton FSL (HSG-C). Test pits conducted on site generally confirm the NRCS soil mapping as the presence of silty, clayey sand and silty sand was present. Test pits logs can be found in Attachment C of this report.

Standard 4.34(a) (City of Worcester WPO)

"Erosion and Sediment Controls must be provided according to a plan conforming to the provisions of Section 3.2 herein and approved by the Conservation Commission."

An Erosion and Sediment Control Plan is included with the design plans. Erosion and sediment controls will consist of catch basin filter bags and compost filter tubes or silt fence along the perimeter and wherever else needed to control erosion of sediments.

Standard 4.34(b) (City of Worcester WPO)

"The general performance of erosion controls shall be considered adequate if there is no visibly silted effluent entering the stormwater system."

The proposed work shall be competitively bid and will be installed by a contractor that will be required to monitor erosion controls to ensure that no visibly silted effluent enters the stormwater system during construction.

Standard 4.34(c) (City of Worcester WPO)

"For projects resulting in the conversion of five thousand (5,000) square feet or more of impervious surface, measures shall be provided to mitigate peak rates of runoff and minimize discharge of pollutants to the stormwater system."

As part of the park design, a subsurface stormwater chamber system will be installed below the proposed parking lot to provide groundwater recharge and temporary detention, resulting in a reduction of peak discharges. Deep sump hooded catch basins and a built-in pretreatment feature of the chamber system will remove hydrocarbons and significant percentages of total suspended solids from the stormwater runoff, providing treatment prior to exfiltrating or discharging to the City drainage infrastructure.

Standard 1: No New Untreated Discharges

The proposed project will create no new untreated discharges. Runoff from pollutant generating impervious areas will be captured in the stormwater management system and treated prior to discharge. No new outlets will be created and all discharges will connect to existing outlets in the City's drainage infrastructure.

Standard 2: Peak Rate Attenuation

Existing and proposed conditions were modeled using HydroCAD computer software. A table, summarizing peak discharges for the 2-Yr, 10-Yr, 25-Yr and 100-Yr storm events can be found in Attachment D of this report. The proposed design is such that peak discharge rates do not exceed pre-development rates, even in the 100-year storm scenario.

To ensure that the work incorporates the performance standards recommended in the DEP's Stormwater Management Policy, necessary erosion and sedimentation control measures will be utilized during construction, as depicted on the site plans.

Standard 3: Recharge

Standard 3 has been met. The required recharge volume has been provided within the proposed stormwater BMP based upon the adjusted capture area calculation, as the BMP only captures 66% of the impervious area located within the project limits. Supporting calculations can be found in Attachment E of this report.

Standard 4: Water Quality

Standard 4 has been met. Treatment practices have been designed to capture the required water quality volume and remove greater than 80% of total suspended solids. Supporting calculations can be found in Attachment E of this report.

During the project, appropriate BMPs will be used to minimize sedimentation and soil erosion.

Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

This site is not considered a LUHPPL, Standard 5 does not apply.

Standard 6: Critical Areas

This project is not located within any critical areas.

Standard 7: Redevelopments and Other Projects Subject to the Standards Only to the Maximum Extent Practicable

This is a redevelopment project; however, all 10 Standards have been met.

Standard 8: Construction Period Pollution Prevention and Erosion and Sediment Control

A detailed Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan is included in Attachment G of this report. To ensure that the work incorporates the performance standards recommended in the DEP's

Stormwater Management Policy, necessary erosion and sedimentation control measures will be utilized during construction.

Standard 9: Operation and Maintenance Plan

An operations and maintenance plan is included in Attachment H of this report.

Standard 10: Prohibition of Illicit Discharges

An illicit discharge compliance statement has been included in Attachment I of this report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including any relevant soil evaluations, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan, the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

3/22/2023

Signature and Date

Attachment A - Locus Map

250 125 0 250

SCALE 1"= 250

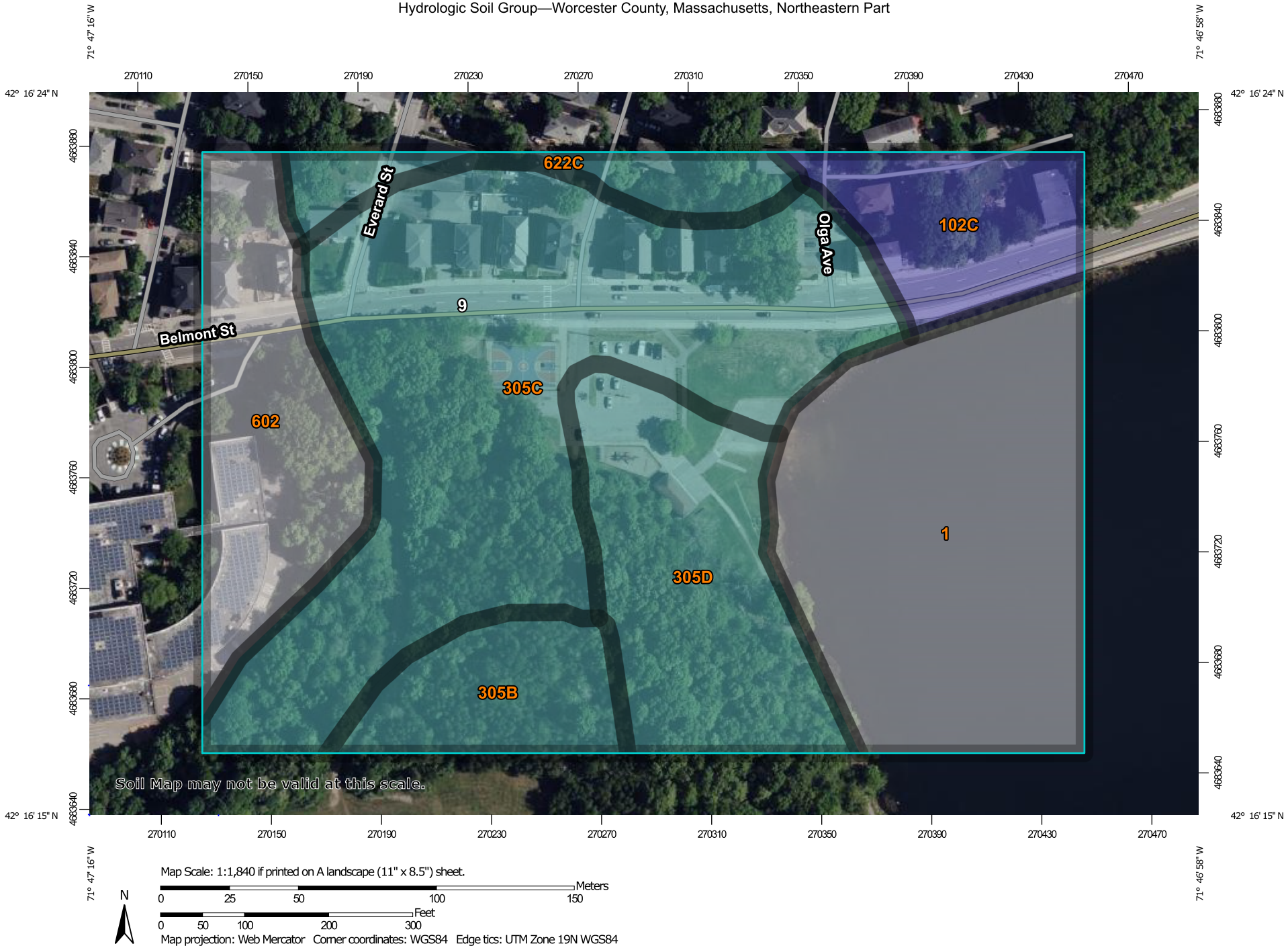
LOCUS MAP

Weston & Sampson℠

Weston & Sampson Engineers, Inc.

55 Walkers Brook Drive, Suite 100, Reading MA 01867

Attachment B - NRCS Soils Map, Soils Report, and HSG Classifications



Map Scale: 1:1,840 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Lines

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Points

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Worcester County, Massachusetts, Northeastern Part
Survey Area Data: Version 17, Sep 9, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Water		4.0	23.0%
102C	Chatfield-Hollis-Rock outcrop complex, 0 to 15 percent slopes	B	1.2	7.0%
305B	Paxton fine sandy loam, 3 to 8 percent slopes	C	1.0	6.0%
305C	Paxton fine sandy loam, 8 to 15 percent slopes	C	6.0	34.9%
305D	Paxton fine sandy loam, 15 to 25 percent slopes	C	2.3	13.4%
602	Urban land		2.0	11.5%
622C	Paxton-Urban land complex, 8 to 15 percent slopes	C	0.7	4.2%
Totals for Area of Interest			**17.3**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Attachment C - Test Pit Logs

Weston & Sampson

Bell Pond Site Improvements

TEST PIT ID: TP-1

WSE Project: ENG22-0194

196 Belmont St, Worcester, MA

CONTRACTOR:	**City of Worcester DPW**	TEST PIT LOCATION:	**See Attached Figure**	DATE START:	**August 19, 2022**
OPERATOR:	**Jesse Nadeau**	PLAN DIMENSIONS:	**Length: 8.0 ft. , Width: 2.5 ft.**	DATE FINISH:	**August 19, 2022**
LOGGED BY:	**Aaron Chabot, E.I.T.**	SEEPAGE REMARKS:	**No Seepage Observed**	GROUND EL:	**Not Available**
CHECKED BY:	**Hector Flores**	CAVING REMARKS:	**No Caving Observed**	FINAL DEPTH:	**8.0 ft.**
EQUIPMENT:	**John Deere 310SL Backhoe**	BACKFILL MATERIAL:	**Excavated Soil**	GRID COORDS:	**N/A**
BUCKET TYPE:	**Toothed, 24-in. (6.4 cubic-ft.)**	OTHER COMMENTS:		GRID SYSTEM:	**N/A**

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
			Surface: Grass area.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
			Topsoil- 4 inches thick.		
	G		**Silty sand (SM)** - Light brown; moist; mostly fine SAND, some non plastic fines, trace fine gravel; trace plastic and glass, trace wood. **[FILL]**		
5			**Silt with sand (ML)** - Brown; moist; mostly low plasticity FINES, few fine to medium sand, few fine to coarse gravel; common cobbles. **[GLACIAL TILL]**	-5	
					Exploration ended at 8.0 ft.

1. Excavation Spoil Pile

2. Bottom of Test Pit

3. Sidewall Profile

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Weston & Sampson

Bell Pond Site Improvements

TEST PIT ID: TP-2

WSE Project: ENG22-0194

196 Belmont St, Worcester, MA

CONTRACTOR:	**City of Worcester DPW**	TEST PIT LOCATION:	**See Attached Figure**	DATE START:	**August 19, 2022**
OPERATOR:	**Jesse Nadeau**	PLAN DIMENSIONS:	**Length: 7.0 ft. , Width: 3.5 ft.**	DATE FINISH:	**August 19, 2022**
LOGGED BY:	**Aaron Chabot, E.I.T.**	SEEPAGE REMARKS:	**No Seepage Observed**	GROUND EL:	**Not Available**
CHECKED BY:	**Hector Flores**	CAVING REMARKS:	**No Caving Observed**	FINAL DEPTH:	**8.5 ft.**
EQUIPMENT:	**John Deere 310SL Backhoe**	BACKFILL MATERIAL:	**Excavated Soil**	GRID COORDS:	**N/A**
BUCKET TYPE:	**Toothed, 24-in. (6.4 cubic-ft.)**	OTHER COMMENTS:		GRID SYSTEM:	**N/A**

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
			Surface: Grass area.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
			Topsoil- 5 inches thick.		
			Silty sand (SM) - Light brown; moist; mostly fine to coarse SAND, some non plastic fines, trace fine gravel; trace plastic. **[FILL]**		
			Poorly graded sand with silt (SP-SM) - Light brown; moist; mostly fine to medium SAND, few non plastic fines, trace fine gravel; trace plastic. **[FILL]**		
5	G		**Silt with sand (ML)** - Brown; moist; mostly low plasticity FINES, few fine to medium sand, few fine to coarse gravel; occasional cobbles. **[GLACIAL TILL]**	-5	
					Exploration ended at 8.5 ft.

1. Excavation Spoil Pile

2. Bottom of Test Pit

3. Sidewall Profile

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Weston & Sampson

Bell Pond Site Improvements

TEST PIT ID: TP-3

WSE Project: ENG22-0194

196 Belmont St, Worcester, MA

CONTRACTOR:	**City of Worcester DPW**	TEST PIT LOCATION:	**See Attached Figure**	DATE START:	**August 19, 2022**
OPERATOR:	**Jesse Nadeau**	PLAN DIMENSIONS:	**Length: 8.0 ft. , Width: 2.5 ft.**	DATE FINISH:	**August 19, 2022**
LOGGED BY:	**Aaron Chabot, E.I.T.**	SEEPAGE REMARKS:	**No Seepage Observed**	GROUND EL:	**Not Available**
CHECKED BY:	**Hector Flores**	CAVING REMARKS:	**No Caving Observed**	FINAL DEPTH:	**9.5 ft.**
EQUIPMENT:	**John Deere 310SL Backhoe**	BACKFILL MATERIAL:	**Excavated Soil**	GRID COORDS:	**N/A**
BUCKET TYPE:	**Toothed, 24-in. (6.4 cubic-ft.)**	OTHER COMMENTS:		GRID SYSTEM:	**N/A**

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
			Surface: Grass area.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
			Topsoil- 5 inches thick.		
	G		**Well graded gravel with silt and sand (GW-GM)** - Moist; mostly fine to coarse GRAVEL, little fine to coarse sand, few non plastic fines; occasional wood, trace brick. **[FILL]**		
	G		**Poorly graded sand (SP)** - Light brown; moist; mostly fine to medium SAND, trace fine gravel, trace non plastic fines; common wood, trace brick, trace plastic. **[FILL]**		
5	G		**Silty, clayey sand with gravel (SC-SM)** - Dark brown; moist to wet; some fine to medium SAND, some low plasticity fines, little fine to coarse gravel; occasional cobbles. **[GLACIAL TILL]**	-5	
	G		*Soil wet.*		[7.5 - 9.5] GC: 16.7%, SC: 39.6%, FC: 43.7%, MC: 21.5%, LL: 21%, PL: 15%.
					Exploration ended at 9.5 ft.

1. Excavation Spoil Pile

2. Bottom of Test Pit

3. Sidewall Profile

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

NOTES:

1. TEST PIT LOCATIONS SHOWN WERE LOCATED USING A HANDHELD GPS UNIT AND ARE APPROXIMATE.
2. TEST PITS WERE COMPLETED BY THE DEPARTMENT OF PUBLIC WORKS AND PARKS OF WORCESTER, MASSACHUSETTS AND OBSERVED BY WESTON & SAMPSON ENGINEERS ON AUGUST 19, 2022.

N

SCALE: 1" = 50'

TP-# DESIGNATION AND APPROXIMATE LOCATION OF TEST PIT.

FIGURE 1

TEST PIT LOCATION PLAN

BELL POND SITE IMPROVEMENTS

WORCESTER, MASSACHUSETTS

DESIGNED BY: HDF	CHECKED BY: JM	DATE: OCTOBER 2022

Weston & Sampson℠

Attachment D - HydroCAD Reports

NOAA Atlas 14, Volume 10, Version 3
Location name: Worcester, Massachusetts, USA*
Latitude: 42.2721°, Longitude: -71.7854°
Elevation: 673.73 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.343** (0.272-0.426)	**0.403** (0.320-0.501)	**0.501** (0.396-0.626)	**0.583** (0.458-0.733)	**0.695** (0.527-0.915)	**0.781** (0.578-1.05)	**0.869** (0.621-1.22)	**0.964** (0.653-1.39)	**1.10** (0.712-1.65)	**1.20** (0.759-1.85)
10-min	**0.485** (0.386-0.603)	**0.571** (0.453-0.710)	**0.711** (0.563-0.888)	**0.826** (0.649-1.04)	**0.985** (0.746-1.30)	**1.11** (0.818-1.49)	**1.23** (0.879-1.72)	**1.36** (0.925-1.97)	**1.55** (1.01-2.33)	**1.70** (1.08-2.61)
15-min	**0.571** (0.454-0.710)	**0.671** (0.533-0.836)	**0.835** (0.661-1.04)	**0.971** (0.764-1.22)	**1.16** (0.878-1.53)	**1.30** (0.963-1.75)	**1.45** (1.03-2.03)	**1.61** (1.09-2.32)	**1.83** (1.19-2.74)	**2.00** (1.27-3.08)
30-min	**0.773** (0.615-0.962)	**0.910** (0.723-1.13)	**1.13** (0.897-1.42)	**1.32** (1.04-1.66)	**1.58** (1.19-2.07)	**1.77** (1.31-2.38)	**1.97** (1.41-2.76)	**2.18** (1.48-3.16)	**2.48** (1.61-3.73)	**2.72** (1.72-4.18)
60-min	**0.976** (0.775-1.21)	**1.15** (0.912-1.43)	**1.43** (1.13-1.79)	**1.67** (1.31-2.10)	**1.99** (1.51-2.62)	**2.24** (1.65-3.01)	**2.49** (1.78-3.48)	**2.76** (1.87-3.99)	**3.14** (2.04-4.72)	**3.44** (2.18-5.29)
2-hr	**1.23** (0.985-1.52)	**1.46** (1.17-1.81)	**1.84** (1.47-2.29)	**2.15** (1.70-2.69)	**2.59** (1.98-3.40)	**2.91** (2.17-3.92)	**3.25** (2.35-4.57)	**3.65** (2.48-5.24)	**4.22** (2.75-6.31)	**4.70** (2.99-7.19)
3-hr	**1.41** (1.13-1.73)	**1.68** (1.35-2.07)	**2.13** (1.70-2.63)	**2.50** (1.98-3.11)	**3.01** (2.31-3.95)	**3.39** (2.54-4.56)	**3.80** (2.76-5.33)	**4.28** (2.91-6.13)	**4.99** (3.26-7.44)	**5.60** (3.56-8.52)
6-hr	**1.77** (1.43-2.16)	**2.13** (1.72-2.61)	**2.72** (2.19-3.34)	**3.21** (2.56-3.97)	**3.88** (3.00-5.07)	**4.38** (3.31-5.87)	**4.92** (3.61-6.89)	**5.57** (3.81-7.94)	**6.55** (4.29-9.70)	**7.39** (4.72-11.2)
12-hr	**2.19** (1.78-2.66)	**2.66** (2.16-3.24)	**3.42** (2.77-4.18)	**4.06** (3.26-4.99)	**4.93** (3.83-6.40)	**5.58** (4.24-7.42)	**6.28** (4.62-8.74)	**7.12** (4.89-10.1)	**8.39** (5.51-12.3)	**9.47** (6.06-14.2)
24-hr	**2.60** (2.13-3.14)	**3.18** (2.60-3.85)	**4.12** (3.36-5.01)	**4.91** (3.97-6.00)	**5.99** (4.68-7.72)	**6.79** (5.18-8.98)	**7.65** (5.66-10.6)	**8.69** (5.99-12.2)	**10.3** (6.77-15.0)	**11.6** (7.47-17.4)
2-day	**2.95** (2.44-3.55)	**3.63** (2.99-4.36)	**4.74** (3.88-5.71)	**5.65** (4.60-6.86)	**6.91** (5.44-8.87)	**7.85** (6.03-10.3)	**8.86** (6.61-12.2)	**10.1** (6.99-14.1)	**12.0** (7.95-17.5)	**13.7** (8.82-20.3)
3-day	**3.21** (2.66-3.84)	**3.94** (3.25-4.71)	**5.13** (4.22-6.16)	**6.11** (5.00-7.39)	**7.47** (5.90-9.55)	**8.47** (6.54-11.1)	**9.57** (7.16-13.2)	**10.9** (7.56-15.2)	**13.0** (8.61-18.8)	**14.8** (9.55-21.9)
4-day	**3.44** (2.86-4.11)	**4.21** (3.49-5.02)	**5.45** (4.50-6.54)	**6.49** (5.32-7.83)	**7.91** (6.26-10.1)	**8.96** (6.93-11.7)	**10.1** (7.58-13.9)	**11.5** (8.00-16.0)	**13.7** (9.09-19.7)	**15.6** (10.1-22.9)
7-day	**4.11** (3.43-4.87)	**4.94** (4.11-5.86)	**6.29** (5.22-7.50)	**7.42** (6.11-8.90)	**8.96** (7.12-11.3)	**10.1** (7.84-13.1)	**11.3** (8.51-15.4)	**12.8** (8.95-17.7)	**15.1** (10.1-21.7)	**17.1** (11.0-25.0)
10-day	**4.77** (4.00-5.64)	**5.64** (4.71-6.67)	**7.05** (5.87-8.38)	**8.22** (6.80-9.83)	**9.84** (7.83-12.4)	**11.0** (8.57-14.2)	**12.3** (9.24-16.6)	**13.8** (9.67-19.0)	**16.1** (10.7-22.9)	**18.0** (11.7-26.2)
20-day	**6.81** (5.74-8.00)	**7.73** (6.51-9.09)	**9.23** (7.74-10.9)	**10.5** (8.72-12.4)	**12.2** (9.73-15.1)	**13.5** (10.5-17.1)	**14.8** (11.1-19.5)	**16.3** (11.4-22.1)	**18.2** (12.2-25.8)	**19.8** (12.9-28.7)
30-day	**8.52** (7.22-9.97)	**9.47** (8.01-11.1)	**11.0** (9.28-13.0)	**12.3** (10.3-14.6)	**14.1** (11.3-17.3)	**15.4** (12.0-19.4)	**16.8** (12.5-21.9)	**18.2** (12.8-24.6)	**19.9** (13.4-28.0)	**21.2** (13.8-30.6)
45-day	**10.6** (9.05-12.4)	**11.6** (9.87-13.6)	**13.2** (11.2-15.5)	**14.6** (12.2-17.2)	**16.4** (13.2-20.1)	**17.9** (13.9-22.3)	**19.2** (14.3-24.8)	**20.5** (14.5-27.6)	**22.1** (14.9-30.9)	**23.1** (15.1-33.2)
60-day	**12.4** (10.6-14.4)	**13.4** (11.4-15.6)	**15.1** (12.8-17.6)	**16.5** (13.9-19.4)	**18.4** (14.8-22.4)	**19.9** (15.5-24.7)	**21.3** (15.8-27.2)	**22.5** (16.0-30.2)	**23.9** (16.2-33.4)	**24.8** (16.3-35.6)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

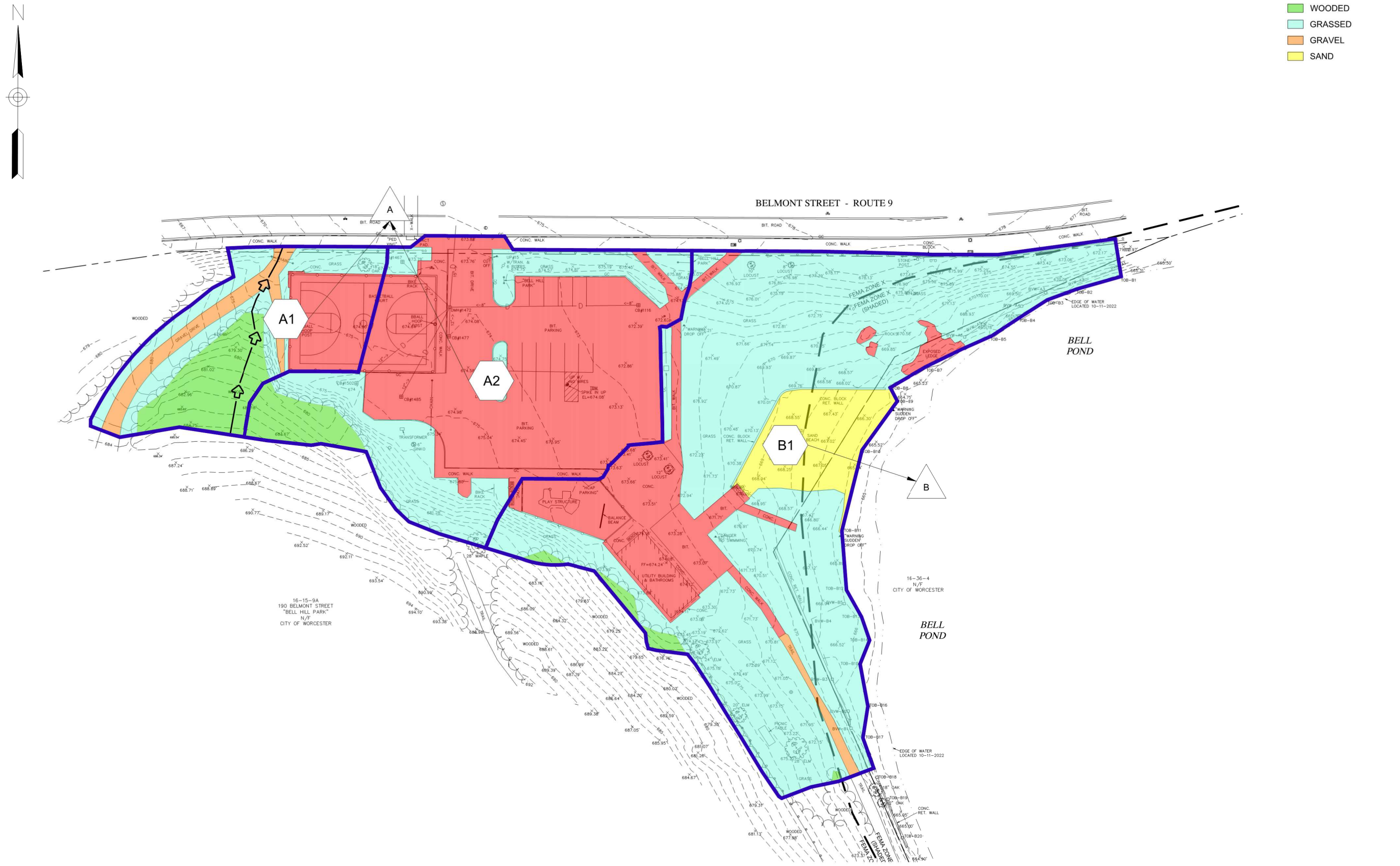
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Stormwater Discharge Summary Table

Bell Pond Improvements
Worcester, MA
March 22, 2023

		Peak Discharge (CFS)	
Analysis Point	**24-Hr Storm Event**	**Pre-Development**	**Post-Development**
A	2-YR	2.25	1.84
	10-YR	4.00	3.07
	25-YR	5.11	3.81
	100-YR	6.80	5.11
B	2-YR	1.88	1.79
	10-YR	3.85	3.60
	25-YR	5.14	4.78
	100-YR	7.15	6.60



Project:

CITY OF WORCESTER
DEPARTMENT OF PUBLIC WORKS & PARKS

BELL POND IMPROVEMENTS

190 BELMONT STREET
WORCESTER, MA 01605

Weston & Sampson

Weston & Sampson Engineers, Inc.
55 Walkers Brook Drive, Suite 100
Reading, MA 01867
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:

Revisions:

No.	Date	Description

Seal:

Issued For:

PERMITTING - NOT FOR CONSTRUCTION

Scale:	AS SHOWN
Date:	MARCH 22, 2023
Drawn By:	AKG
Reviewed By:	JIP
Approved By:	JIP
W&S Project No.:	ENG22-0194
W&S File No.:	

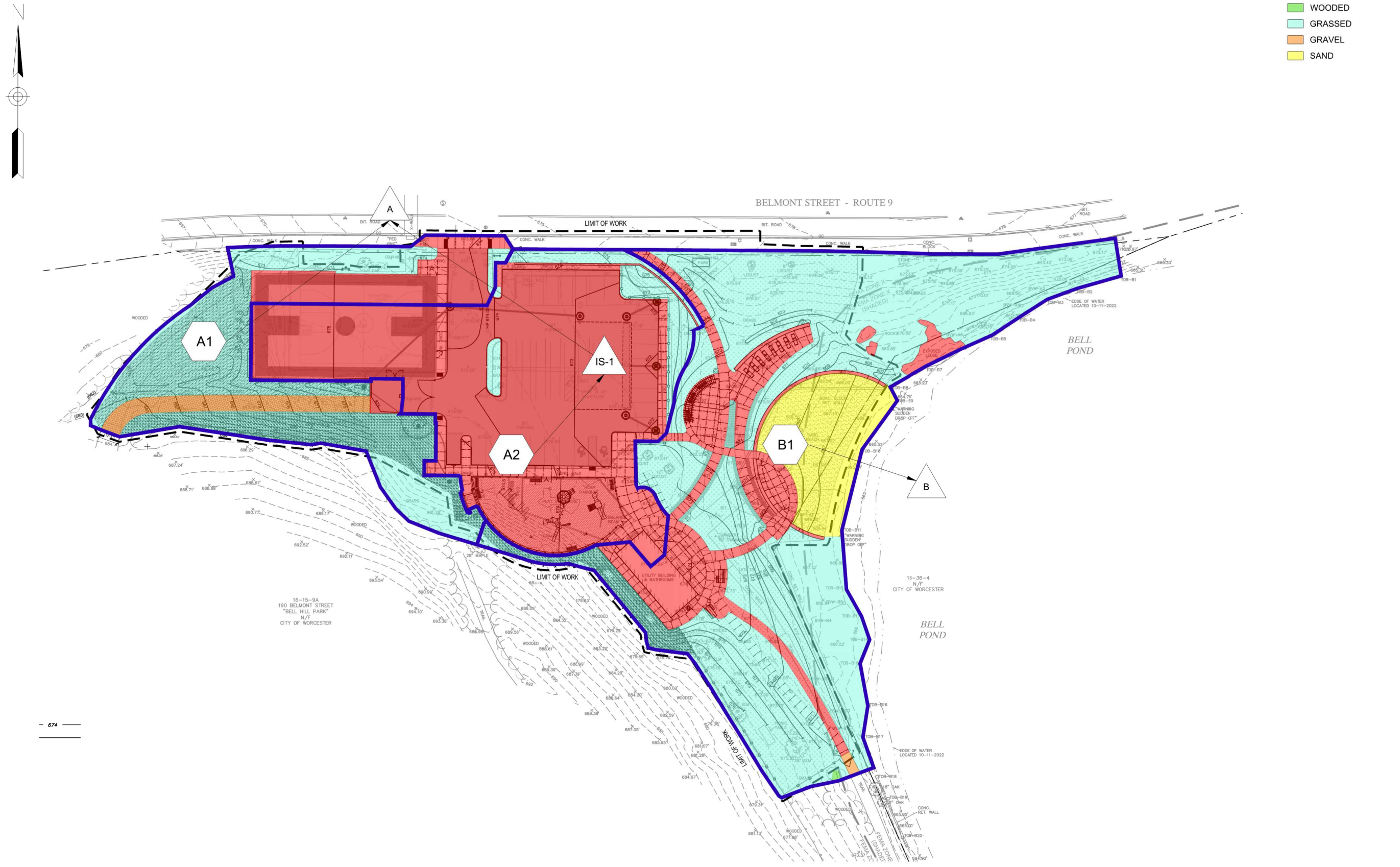
Drawing Title:

EXISTING HYDROLOGIC MAP

Sheet Number:

FIG-1

Rev. 1.8 Date: 10/24/2019



Project:

CITY OF WORCESTER
DEPARTMENT OF PUBLIC WORKS & PARKS

BELL POND IMPROVEMENTS

190 BELMONT STREET
WORCESTER, MA 01605

Weston & Sampson

Weston & Sampson Engineers, Inc.
55 Walkers Brook Drive, Suite 100
Reading, MA 01867
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:

Revisions:

No.	Date	Description

Seal:

Issued For:

PERMITTING - NOT FOR CONSTRUCTION

Scale:	AS SHOWN
Date:	MARCH 22, 2023
Drawn By:	AKG
Reviewed By:	JIP
Approved By:	JIP
W&S Project No.:	ENG22-0194
W&S File No.:	

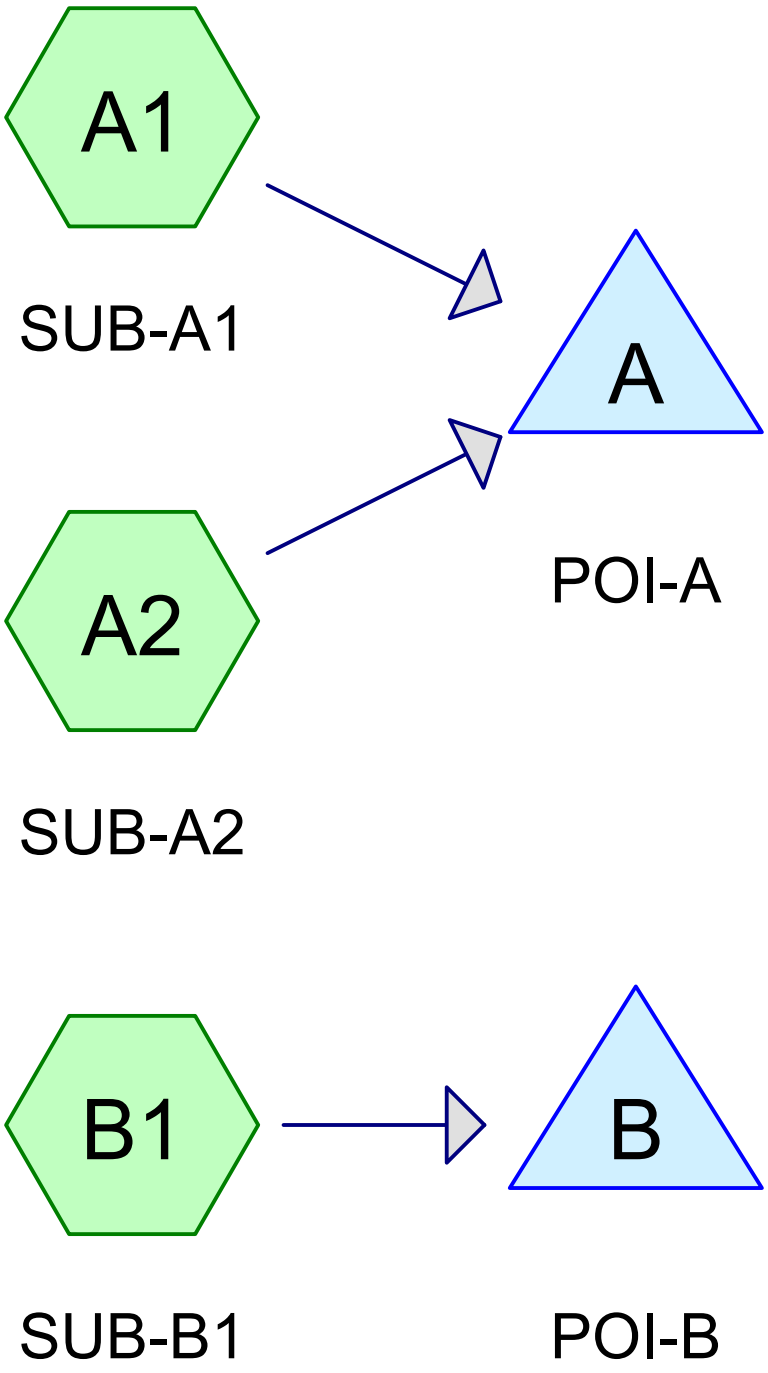
Drawing Title:

PROPOSED HYDROLOGIC MAP

Sheet Number:

FIG-2

Rev: 1.8 Date: 10/24/2019



Subcat Reach Pond Link

Routing Diagram for EX-HydroCAD

Prepared by Weston & Sampson Engineers, Inc, Printed 3/13/2023

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Yr	Type III 24-hr		Default	24.00	1	3.18	2
2	10-Yr	Type III 24-hr		Default	24.00	1	4.91	2
3	25-Yr	Type III 24-hr		Default	24.00	1	5.99	2
4	100-Yr	Type III 24-hr		Default	24.00	1	7.65	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
48,956	74	>75% Grass cover, Good, HSG C (A1, A2, B1)
2,249	89	Gravel, HSG C (A1, B1)
32,838	98	Impervious, HSG C (A1, A2, B1)
4,361	91	Sand, HSG C (B1)
5,776	70	Woods, Good, HSG C (A1, A2, B1)
94,180	**83**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
94,180	HSG C	A1, A2, B1
0	HSG D	
0	Other	
94,180		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
0	0	48,956	0	0	48,956	>75% Grass cover, Good	
0	0	2,249	0	0	2,249	Gravel	
0	0	32,838	0	0	32,838	Impervious	
0	0	4,361	0	0	4,361	Sand	
0	0	5,776	0	0	5,776	Woods, Good	
0	**0**	**94,180**	**0**	**0**	**94,180**	**TOTAL AREA**	

Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=12,431 sf 24.33% Impervious Runoff Depth=1.45"
Flow Length=126' Tc=6.3 min CN=81 Runoff=0.48 cfs 1,506 cf

SubcatchmentA2: SUB-A2 Runoff Area=30,902 sf 68.10% Impervious Runoff Depth=2.15"
Tc=6.0 min CN=90 Runoff=1.77 cfs 5,537 cf

SubcatchmentB1: SUB-B1 Runoff Area=50,847 sf 17.24% Impervious Runoff Depth=1.39"
Tc=6.0 min CN=80 Runoff=1.88 cfs 5,875 cf

Pond A: POI-A Inflow=2.25 cfs 7,042 cf
Primary=2.25 cfs 7,042 cf

Pond B: POI-B Inflow=1.88 cfs 5,875 cf
Primary=1.88 cfs 5,875 cf

Total Runoff Area = 94,180 sf Runoff Volume = 12,918 cf Average Runoff Depth = 1.65"
65.13% Pervious = 61,342 sf 34.87% Impervious = 32,838 sf

Summary for Subcatchment A1: SUB-A1

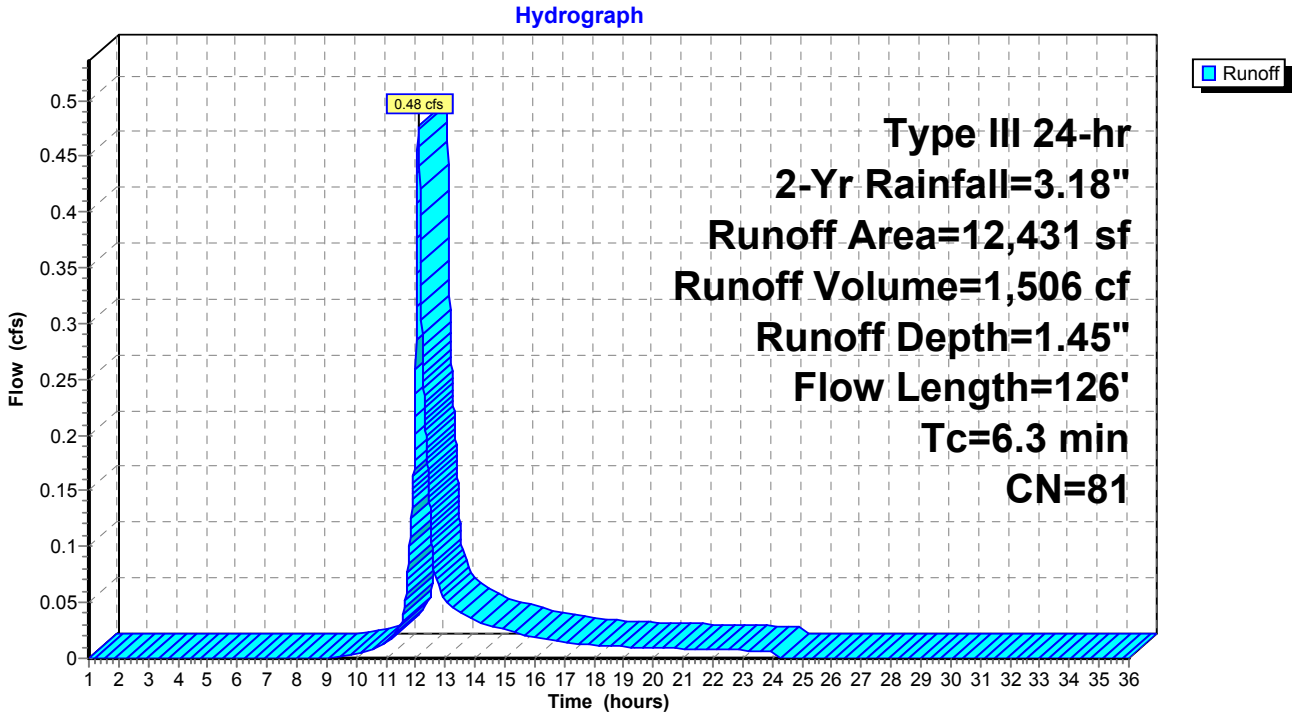
Runoff = 0.48 cfs @ 12.09 hrs, Volume= 1,506 cf, Depth= 1.45"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.18"

	Area (sf)	CN	Description
	4,187	74	>75% Grass cover, Good, HSG C
	3,424	70	Woods, Good, HSG C
*	3,025	98	Impervious, HSG C
*	1,795	89	Gravel, HSG C
	12,431	81	Weighted Average
	9,406		75.67% Pervious Area
	3,025		24.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.2	30	0.1670	2.04		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	16	0.0930	2.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	30	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.3	126	Total			

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

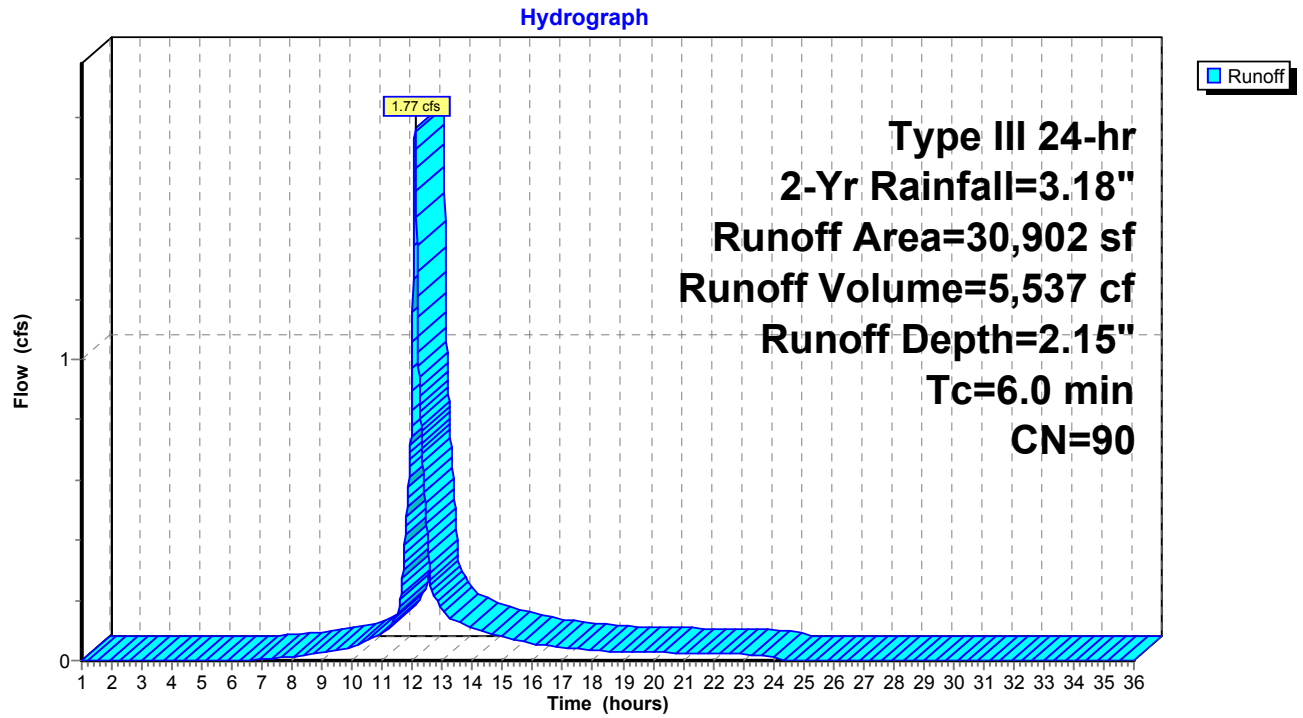
Runoff = 1.77 cfs @ 12.09 hrs, Volume= 5,537 cf, Depth= 2.15"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.18"

	Area (sf)	CN	Description
*	21,045	98	Impervious, HSG C
	8,129	74	>75% Grass cover, Good, HSG C
	1,728	70	Woods, Good, HSG C
	30,902	90	Weighted Average
	9,857		31.90% Pervious Area
	21,045		68.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment A2: SUB-A2



Summary for Subcatchment B1: SUB-B1

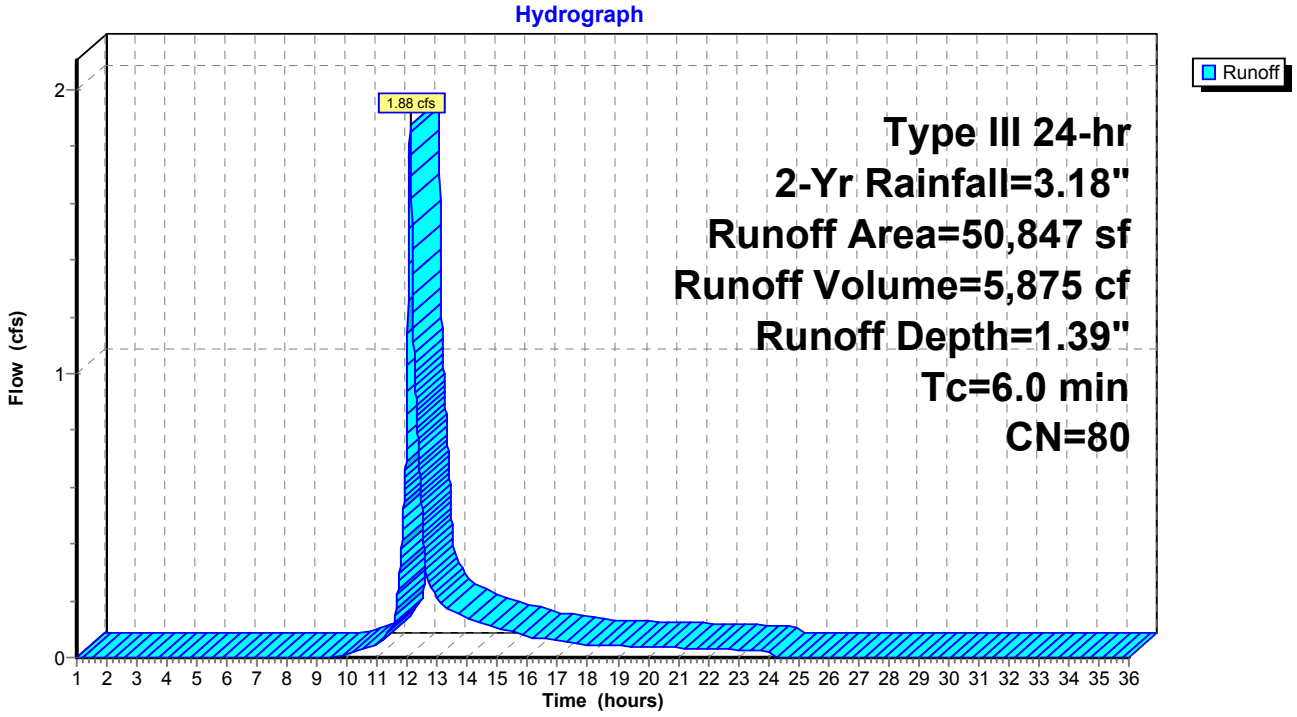
Runoff = 1.88 cfs @ 12.09 hrs, Volume= 5,875 cf, Depth= 1.39"
Routed to Pond B : POI-B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.18"

	Area (sf)	CN	Description
	36,640	74	>75% Grass cover, Good, HSG C
*	8,768	98	Impervious, HSG C
*	4,361	91	Sand, HSG C
	624	70	Woods, Good, HSG C
*	454	89	Gravel, HSG C
	50,847	80	Weighted Average
	42,079		82.76% Pervious Area
	8,768		17.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment B1: SUB-B1

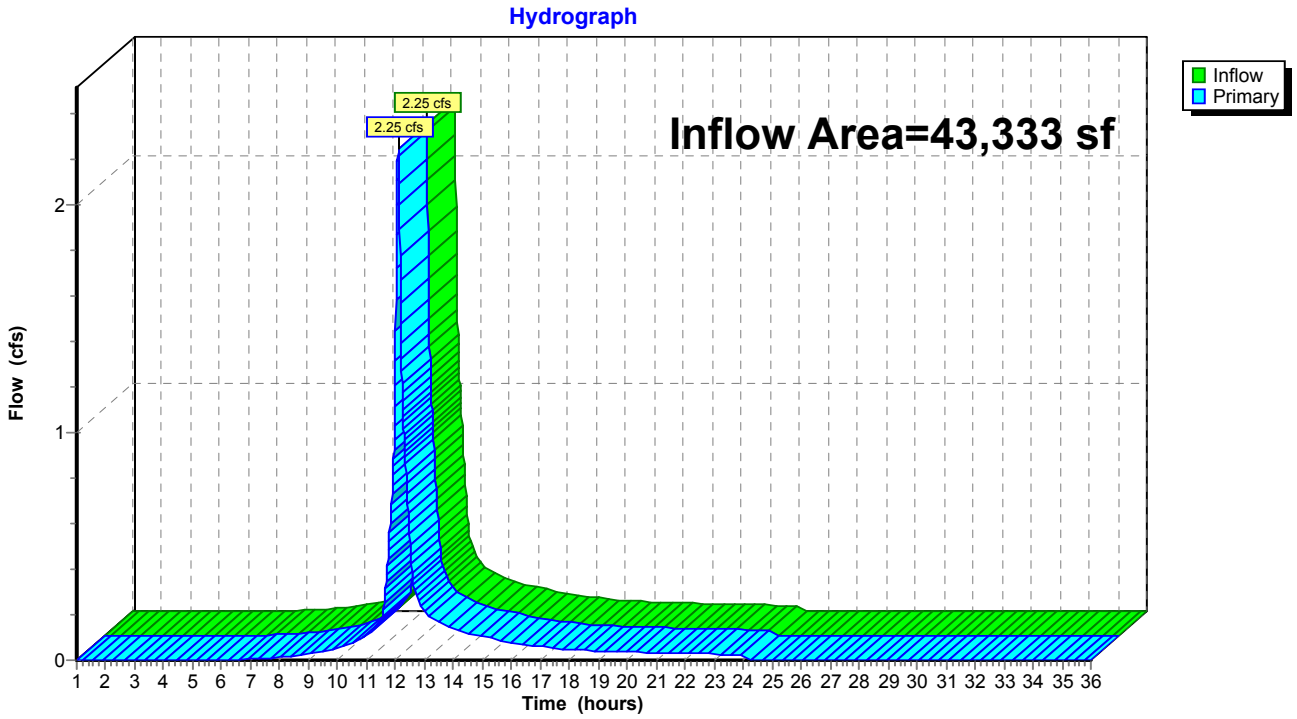


Summary for Pond A: POI-A

Inflow Area = 43,333 sf, 55.55% Impervious, Inflow Depth = 1.95" for 2-Yr event
Inflow = 2.25 cfs @ 12.09 hrs, Volume= 7,042 cf
Primary = 2.25 cfs @ 12.09 hrs, Volume= 7,042 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond A: POI-A

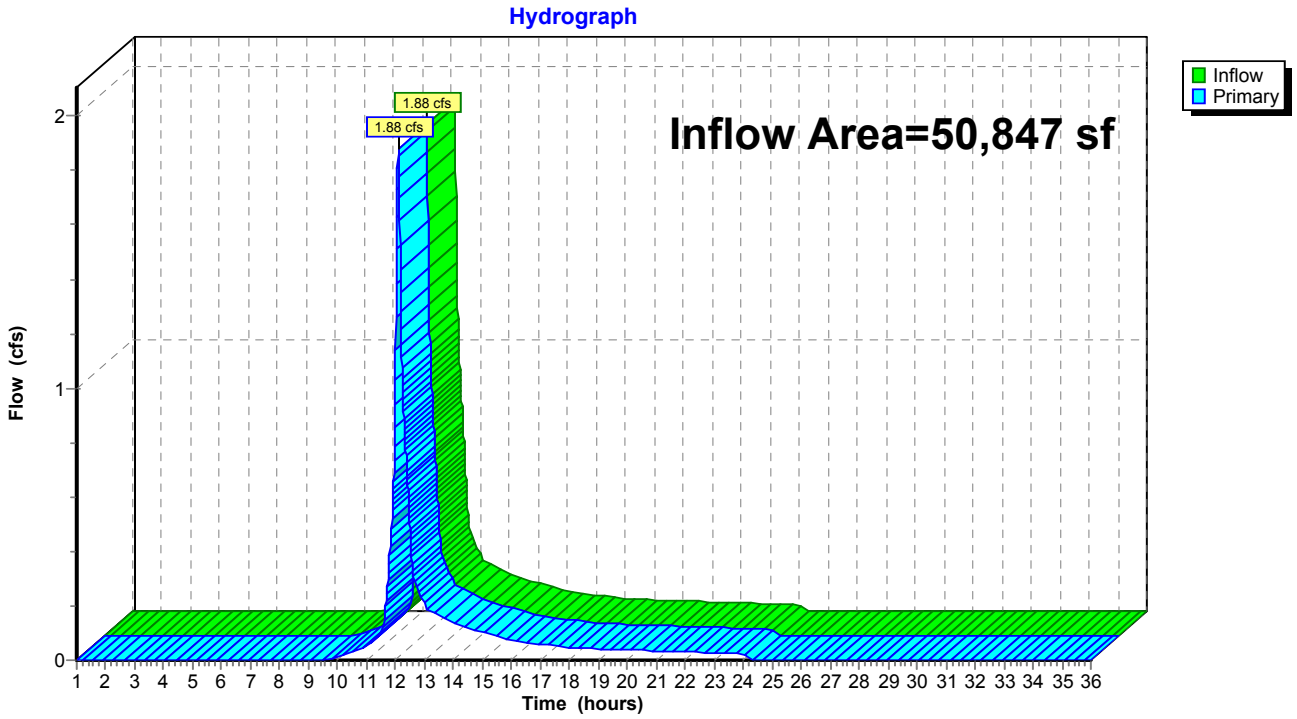


Summary for Pond B: POI-B

Inflow Area = 50,847 sf, 17.24% Impervious, Inflow Depth = 1.39" for 2-Yr event
Inflow = 1.88 cfs @ 12.09 hrs, Volume= 5,875 cf
Primary = 1.88 cfs @ 12.09 hrs, Volume= 5,875 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond B: POI-B



Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=12,431 sf 24.33% Impervious Runoff Depth=2.91"
Flow Length=126' Tc=6.3 min CN=81 Runoff=0.96 cfs 3,010 cf

SubcatchmentA2: SUB-A2 Runoff Area=30,902 sf 68.10% Impervious Runoff Depth=3.79"
Tc=6.0 min CN=90 Runoff=3.04 cfs 9,759 cf

SubcatchmentB1: SUB-B1 Runoff Area=50,847 sf 17.24% Impervious Runoff Depth=2.81"
Tc=6.0 min CN=80 Runoff=3.85 cfs 11,926 cf

Pond A: POI-A Inflow=4.00 cfs 12,769 cf
Primary=4.00 cfs 12,769 cf

Pond B: POI-B Inflow=3.85 cfs 11,926 cf
Primary=3.85 cfs 11,926 cf

Total Runoff Area = 94,180 sf Runoff Volume = 24,695 cf Average Runoff Depth = 3.15"
65.13% Pervious = 61,342 sf 34.87% Impervious = 32,838 sf

Summary for Subcatchment A1: SUB-A1

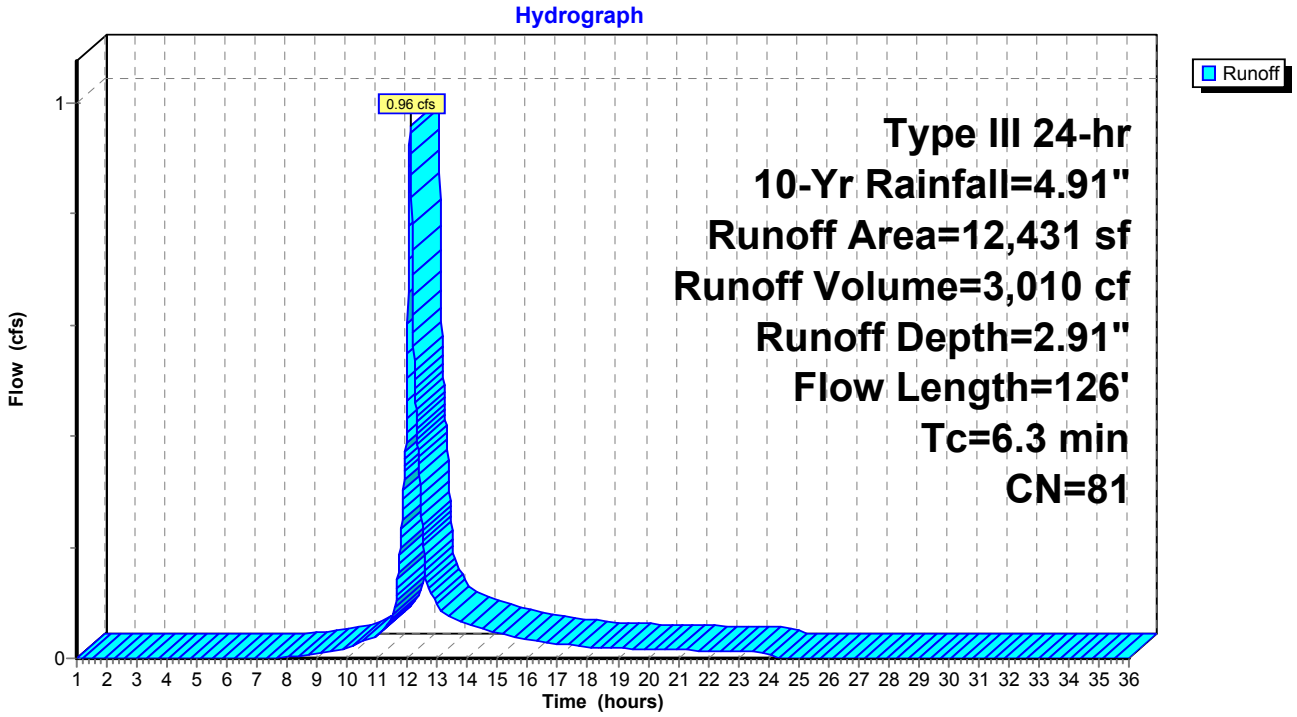
Runoff = 0.96 cfs @ 12.09 hrs, Volume= 3,010 cf, Depth= 2.91"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=4.91"

	Area (sf)	CN	Description
	4,187	74	>75% Grass cover, Good, HSG C
	3,424	70	Woods, Good, HSG C
*	3,025	98	Impervious, HSG C
*	1,795	89	Gravel, HSG C
	12,431	81	Weighted Average
	9,406		75.67% Pervious Area
	3,025		24.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.2	30	0.1670	2.04		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	16	0.0930	2.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	30	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.3	126	Total			

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

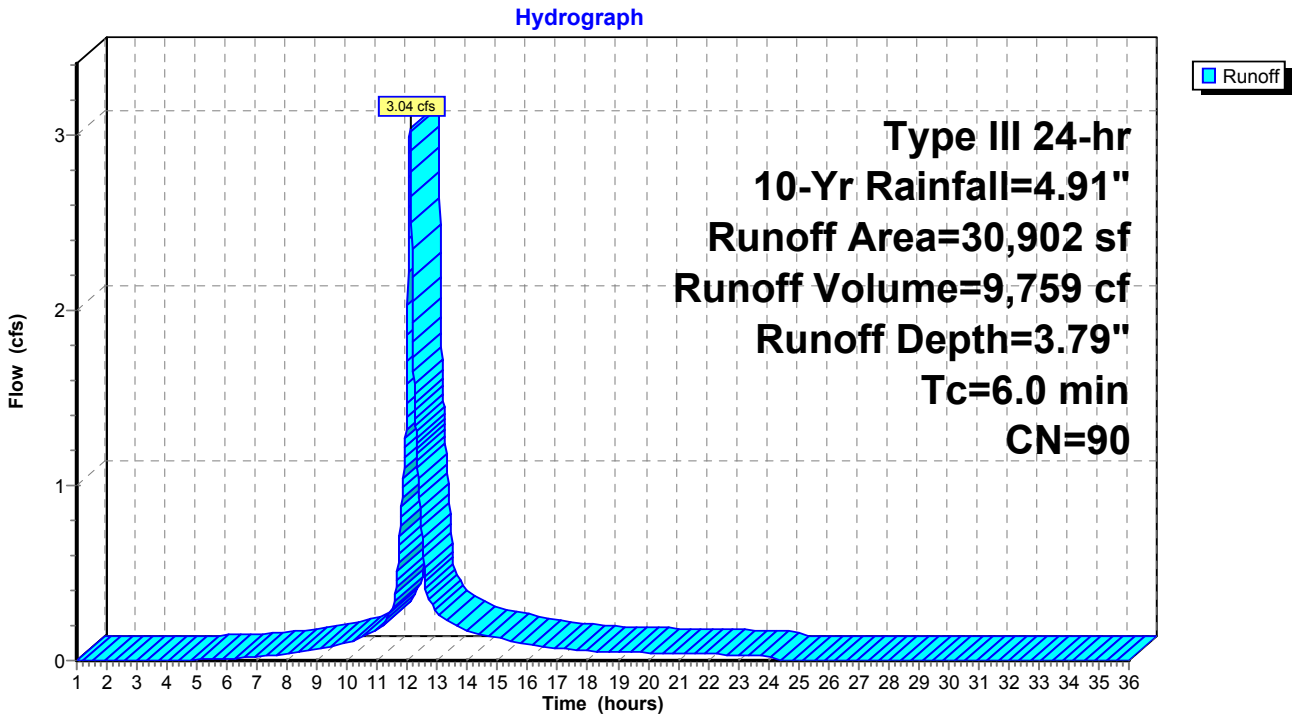
Runoff = 3.04 cfs @ 12.09 hrs, Volume= 9,759 cf, Depth= 3.79"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=4.91"

	Area (sf)	CN	Description
*	21,045	98	Impervious, HSG C
	8,129	74	>75% Grass cover, Good, HSG C
	1,728	70	Woods, Good, HSG C
	30,902	90	Weighted Average
	9,857		31.90% Pervious Area
	21,045		68.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment A2: SUB-A2



Summary for Subcatchment B1: SUB-B1

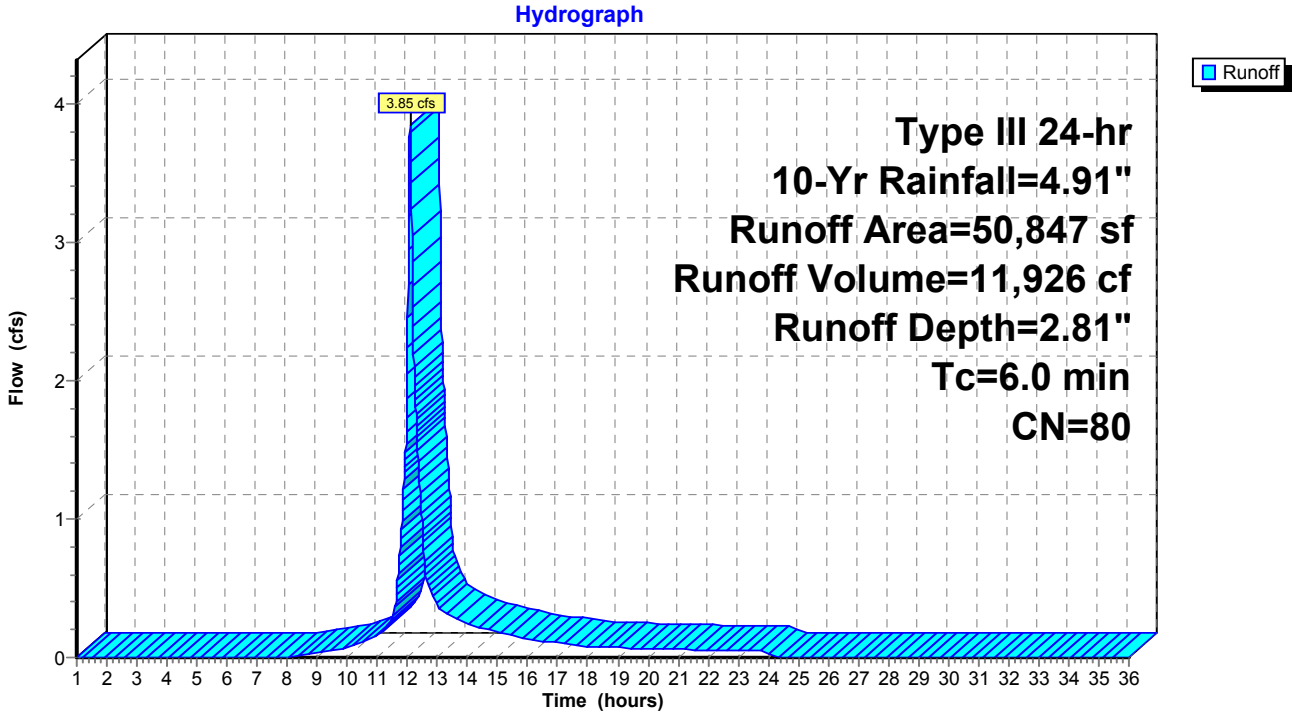
Runoff = 3.85 cfs @ 12.09 hrs, Volume= 11,926 cf, Depth= 2.81"
Routed to Pond B : POI-B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=4.91"

	Area (sf)	CN	Description
	36,640	74	>75% Grass cover, Good, HSG C
*	8,768	98	Impervious, HSG C
*	4,361	91	Sand, HSG C
	624	70	Woods, Good, HSG C
*	454	89	Gravel, HSG C
	50,847	80	Weighted Average
	42,079		82.76% Pervious Area
	8,768		17.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment B1: SUB-B1

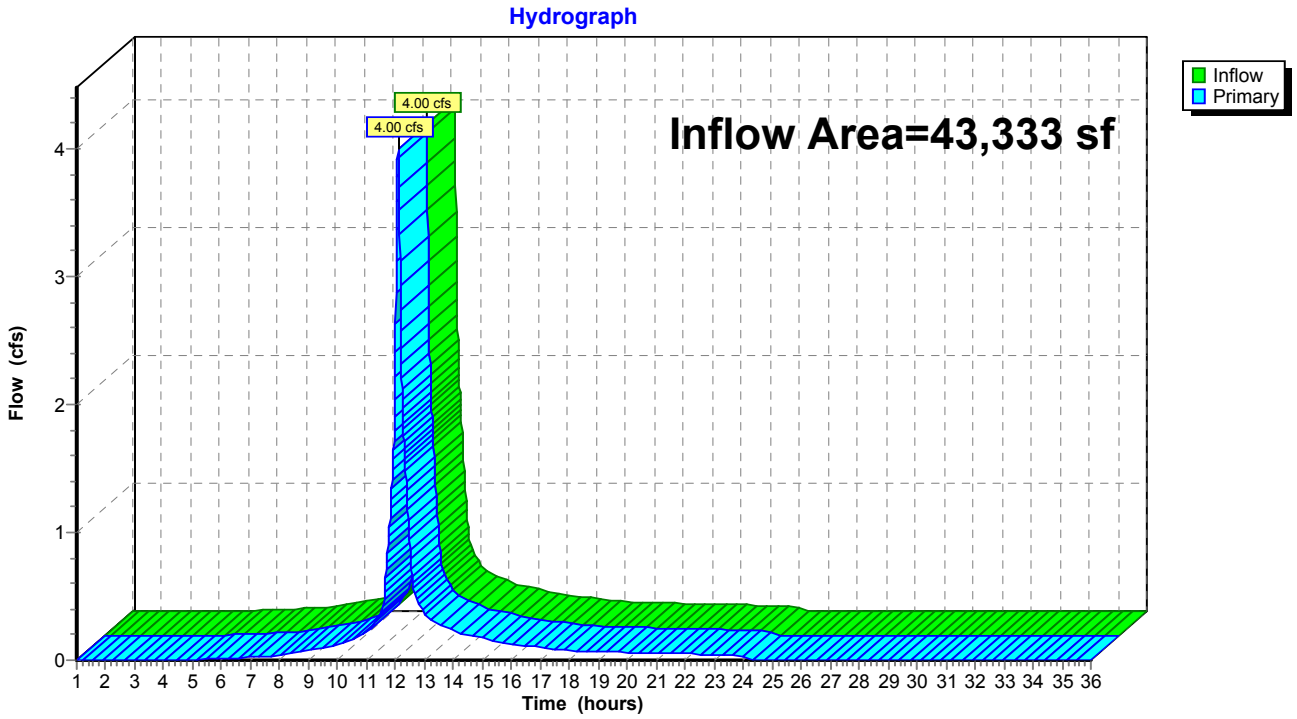


Summary for Pond A: POI-A

Inflow Area = 43,333 sf, 55.55% Impervious, Inflow Depth = 3.54" for 10-Yr event
Inflow = 4.00 cfs @ 12.09 hrs, Volume= 12,769 cf
Primary = 4.00 cfs @ 12.09 hrs, Volume= 12,769 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond A: POI-A

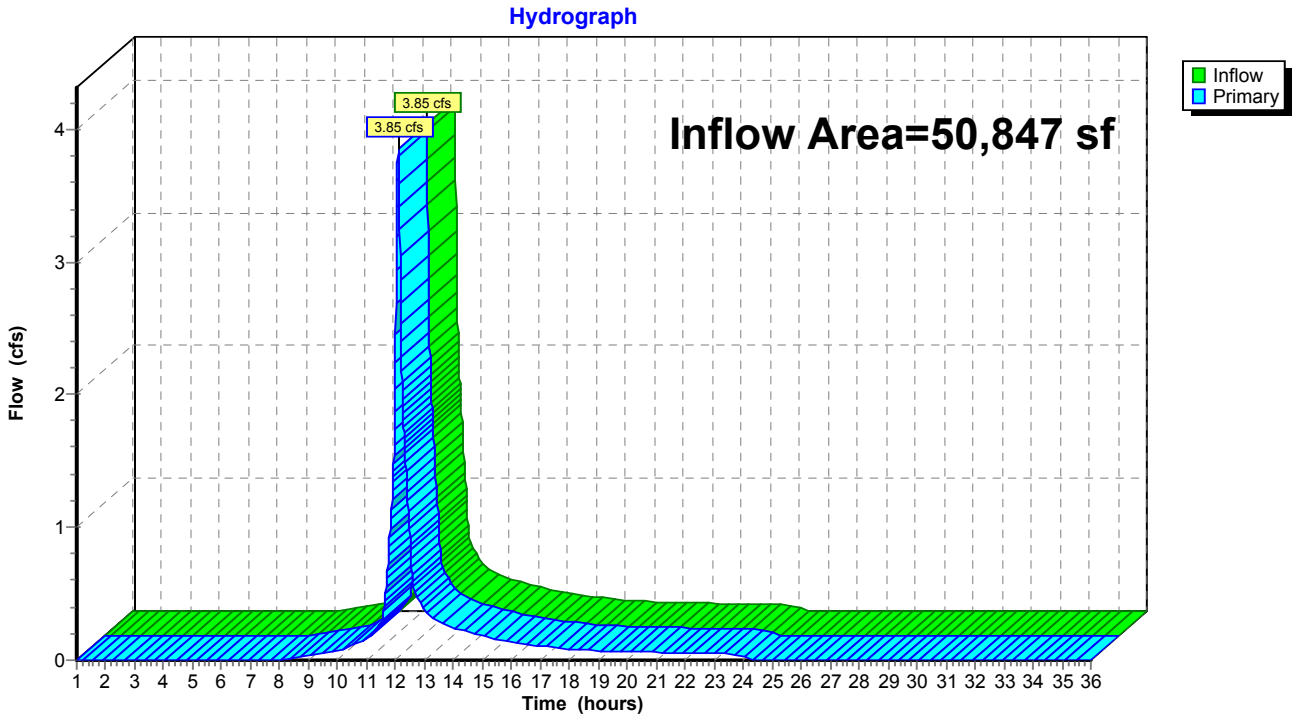


Summary for Pond B: POI-B

Inflow Area = 50,847 sf, 17.24% Impervious, Inflow Depth = 2.81" for 10-Yr event
Inflow = 3.85 cfs @ 12.09 hrs, Volume= 11,926 cf
Primary = 3.85 cfs @ 12.09 hrs, Volume= 11,926 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond B: POI-B



Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=12,431 sf 24.33% Impervious Runoff Depth=3.87"
Flow Length=126' Tc=6.3 min CN=81 Runoff=1.28 cfs 4,014 cf

SubcatchmentA2: SUB-A2 Runoff Area=30,902 sf 68.10% Impervious Runoff Depth=4.84"
Tc=6.0 min CN=90 Runoff=3.83 cfs 12,454 cf

SubcatchmentB1: SUB-B1 Runoff Area=50,847 sf 17.24% Impervious Runoff Depth=3.77"
Tc=6.0 min CN=80 Runoff=5.14 cfs 15,984 cf

Pond A: POI-A Inflow=5.11 cfs 16,468 cf
Primary=5.11 cfs 16,468 cf

Pond B: POI-B Inflow=5.14 cfs 15,984 cf
Primary=5.14 cfs 15,984 cf

Total Runoff Area = 94,180 sf Runoff Volume = 32,452 cf Average Runoff Depth = 4.13"
65.13% Pervious = 61,342 sf 34.87% Impervious = 32,838 sf

Summary for Subcatchment A1: SUB-A1

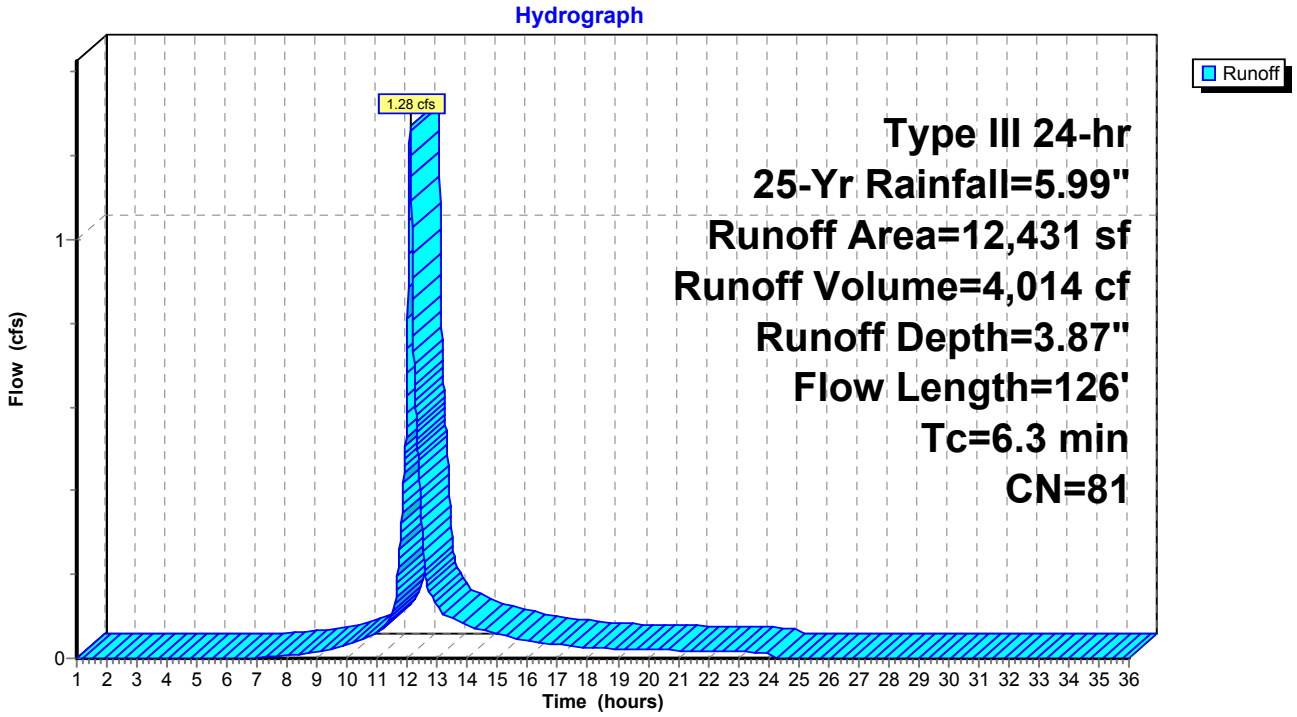
Runoff = 1.28 cfs @ 12.09 hrs, Volume= 4,014 cf, Depth= 3.87"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=5.99"

	Area (sf)	CN	Description
	4,187	74	>75% Grass cover, Good, HSG C
	3,424	70	Woods, Good, HSG C
*	3,025	98	Impervious, HSG C
*	1,795	89	Gravel, HSG C
	12,431	81	Weighted Average
	9,406		75.67% Pervious Area
	3,025		24.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.2	30	0.1670	2.04		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	16	0.0930	2.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	30	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.3	126	Total			

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

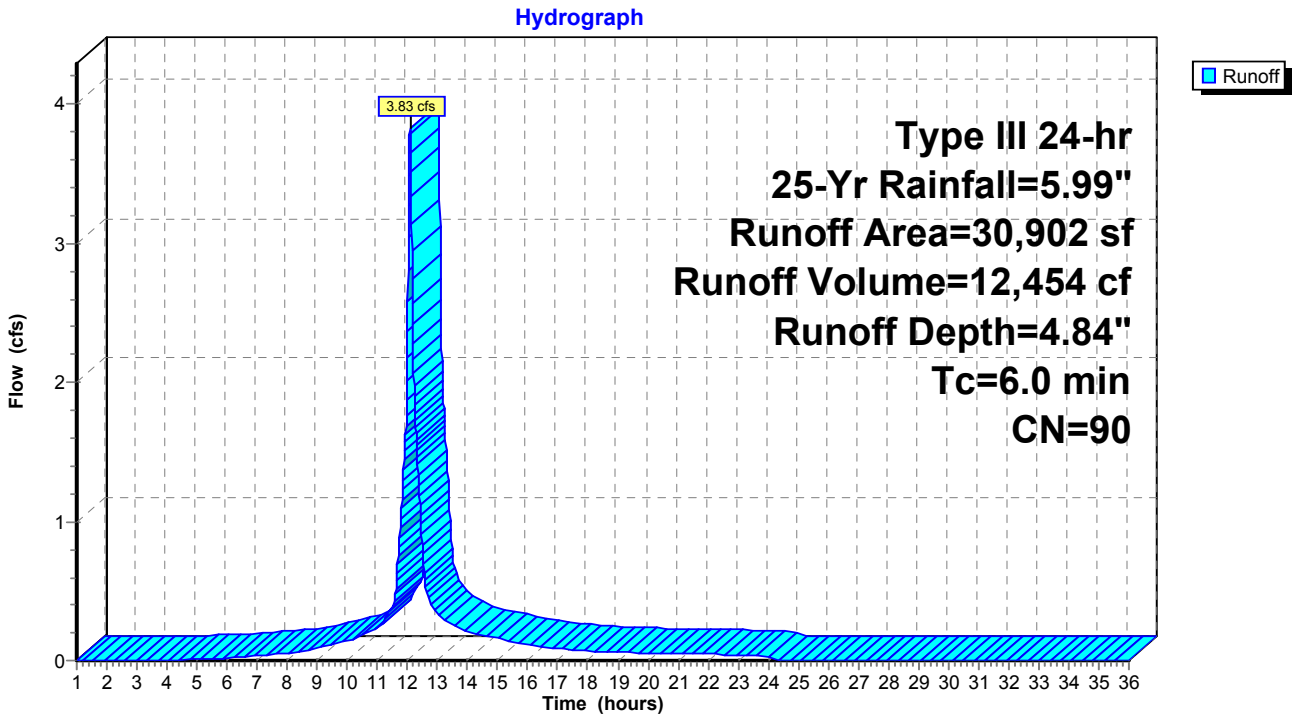
Runoff = 3.83 cfs @ 12.08 hrs, Volume= 12,454 cf, Depth= 4.84"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=5.99"

	Area (sf)	CN	Description
*	21,045	98	Impervious, HSG C
	8,129	74	>75% Grass cover, Good, HSG C
	1,728	70	Woods, Good, HSG C
	30,902	90	Weighted Average
	9,857		31.90% Pervious Area
	21,045		68.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment A2: SUB-A2



Summary for Subcatchment B1: SUB-B1

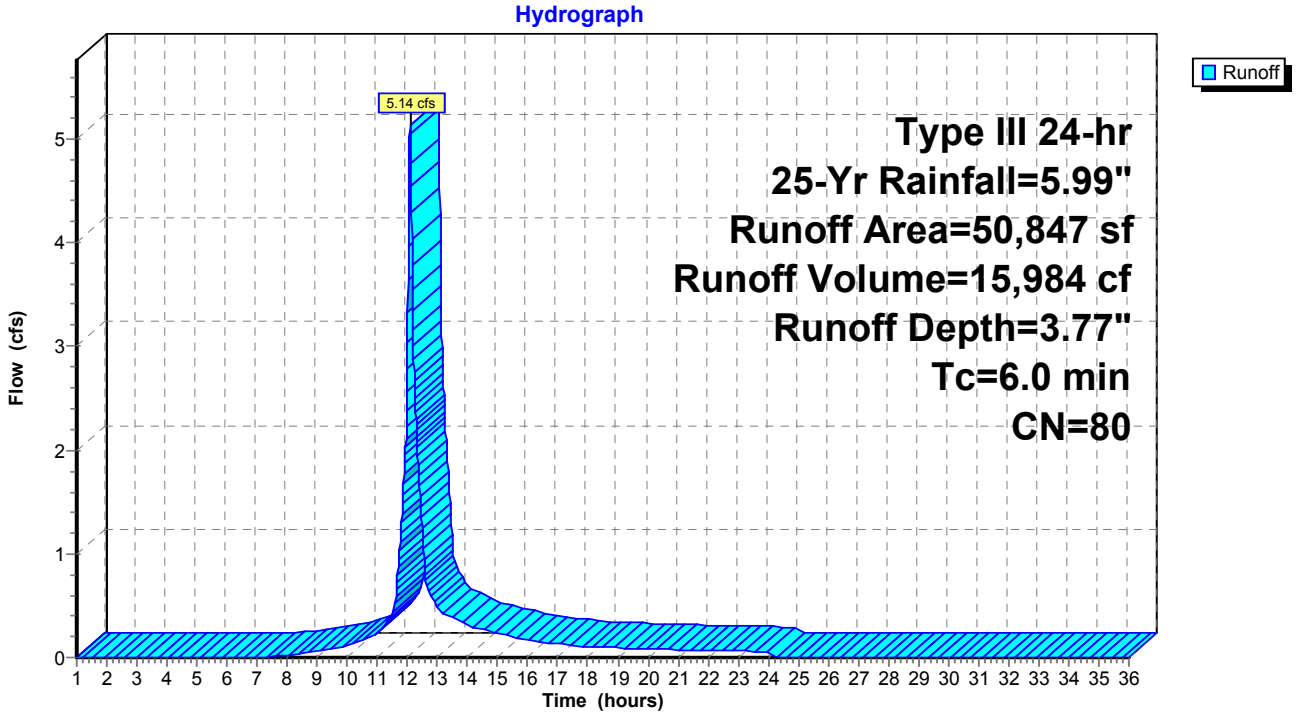
Runoff = 5.14 cfs @ 12.09 hrs, Volume= 15,984 cf, Depth= 3.77"
Routed to Pond B : POI-B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=5.99"

	Area (sf)	CN	Description
	36,640	74	>75% Grass cover, Good, HSG C
*	8,768	98	Impervious, HSG C
*	4,361	91	Sand, HSG C
	624	70	Woods, Good, HSG C
*	454	89	Gravel, HSG C
	50,847	80	Weighted Average
	42,079		82.76% Pervious Area
	8,768		17.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment B1: SUB-B1

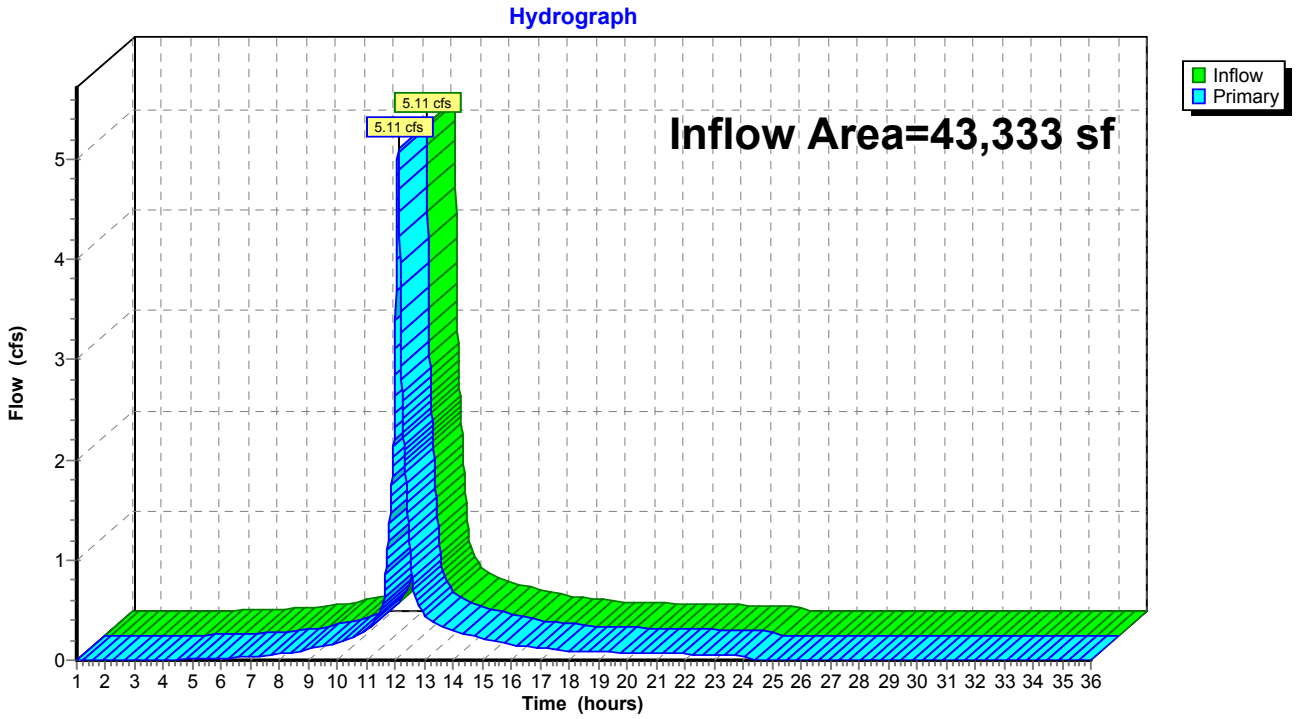


Summary for Pond A: POI-A

Inflow Area = 43,333 sf, 55.55% Impervious, Inflow Depth = 4.56" for 25-Yr event
Inflow = 5.11 cfs @ 12.09 hrs, Volume= 16,468 cf
Primary = 5.11 cfs @ 12.09 hrs, Volume= 16,468 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond A: POI-A

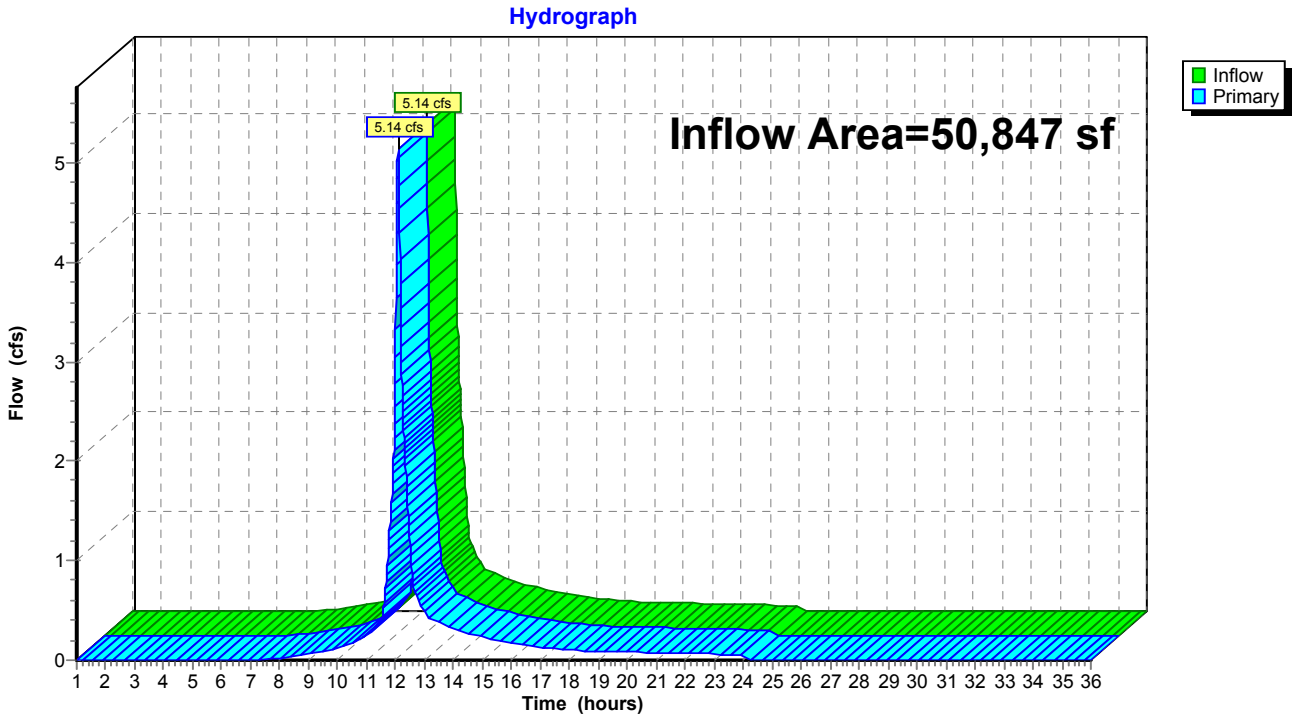


Summary for Pond B: POI-B

Inflow Area = 50,847 sf, 17.24% Impervious, Inflow Depth = 3.77" for 25-Yr event
Inflow = 5.14 cfs @ 12.09 hrs, Volume= 15,984 cf
Primary = 5.14 cfs @ 12.09 hrs, Volume= 15,984 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond B: POI-B



Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=12,431 sf 24.33% Impervious Runoff Depth=5.41"
Flow Length=126' Tc=6.3 min CN=81 Runoff=1.76 cfs 5,607 cf

SubcatchmentA2: SUB-A2 Runoff Area=30,902 sf 68.10% Impervious Runoff Depth=6.46"
Tc=6.0 min CN=90 Runoff=5.04 cfs 16,639 cf

SubcatchmentB1: SUB-B1 Runoff Area=50,847 sf 17.24% Impervious Runoff Depth=5.30"
Tc=6.0 min CN=80 Runoff=7.15 cfs 22,448 cf

Pond A: POI-A Inflow=6.80 cfs 22,246 cf
Primary=6.80 cfs 22,246 cf

Pond B: POI-B Inflow=7.15 cfs 22,448 cf
Primary=7.15 cfs 22,448 cf

Total Runoff Area = 94,180 sf Runoff Volume = 44,693 cf Average Runoff Depth = 5.69"
65.13% Pervious = 61,342 sf 34.87% Impervious = 32,838 sf

Summary for Subcatchment A1: SUB-A1

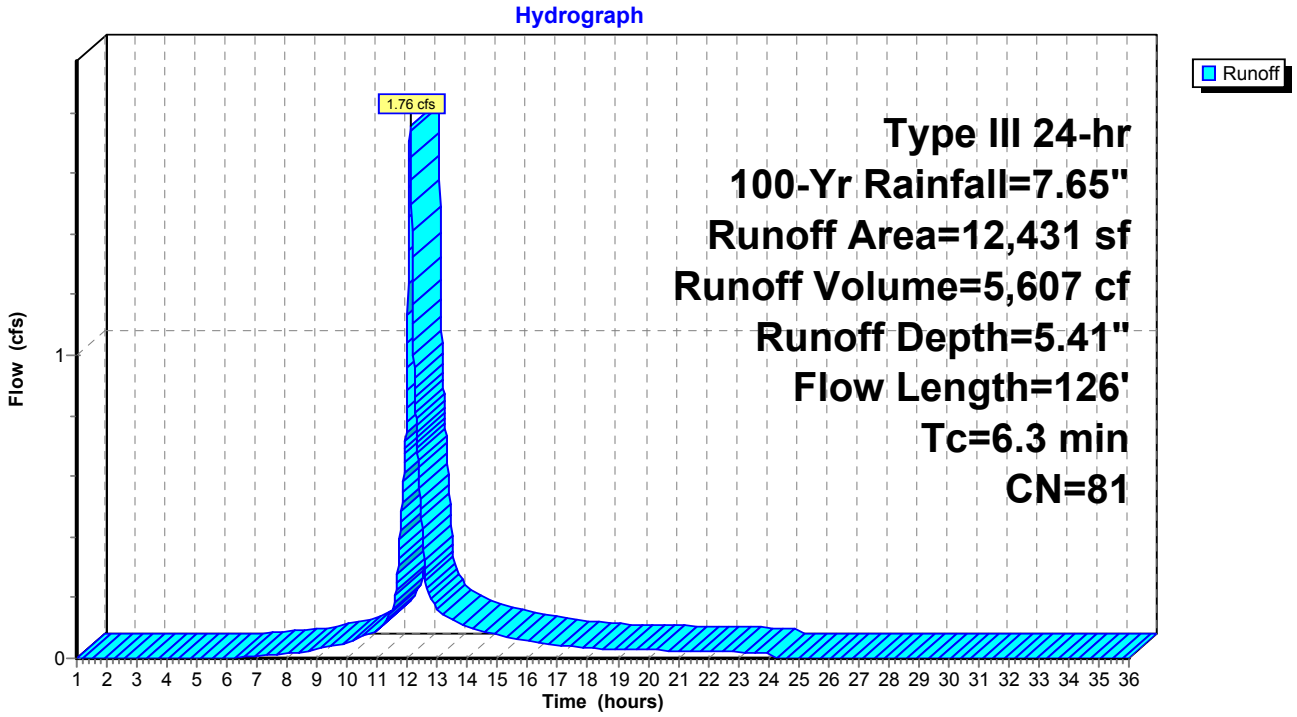
Runoff = 1.76 cfs @ 12.09 hrs, Volume= 5,607 cf, Depth= 5.41"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.65"

	Area (sf)	CN	Description
	4,187	74	>75% Grass cover, Good, HSG C
	3,424	70	Woods, Good, HSG C
*	3,025	98	Impervious, HSG C
*	1,795	89	Gravel, HSG C
	12,431	81	Weighted Average
	9,406		75.67% Pervious Area
	3,025		24.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.2	30	0.1670	2.04		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	16	0.0930	2.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	30	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.3	126	Total			

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

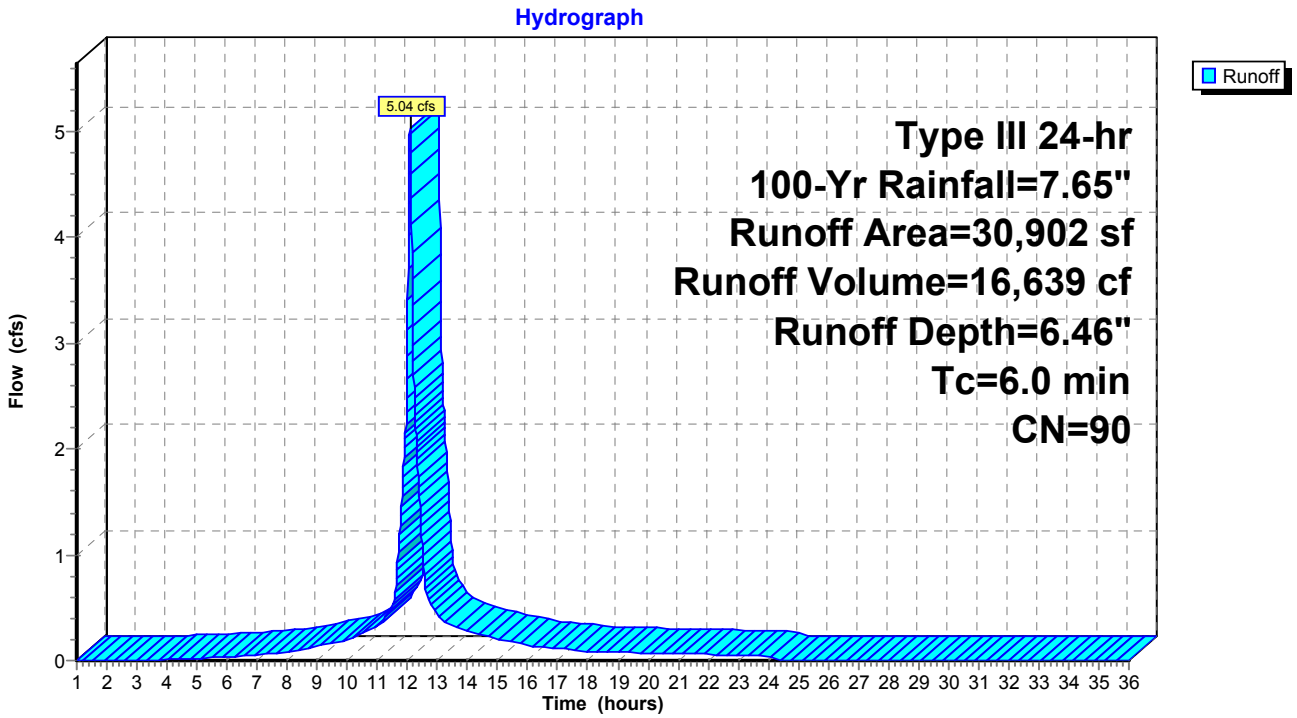
Runoff = 5.04 cfs @ 12.08 hrs, Volume= 16,639 cf, Depth= 6.46"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.65"

	Area (sf)	CN	Description
*	21,045	98	Impervious, HSG C
	8,129	74	>75% Grass cover, Good, HSG C
	1,728	70	Woods, Good, HSG C
	30,902	90	Weighted Average
	9,857		31.90% Pervious Area
	21,045		68.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment A2: SUB-A2



Summary for Subcatchment B1: SUB-B1

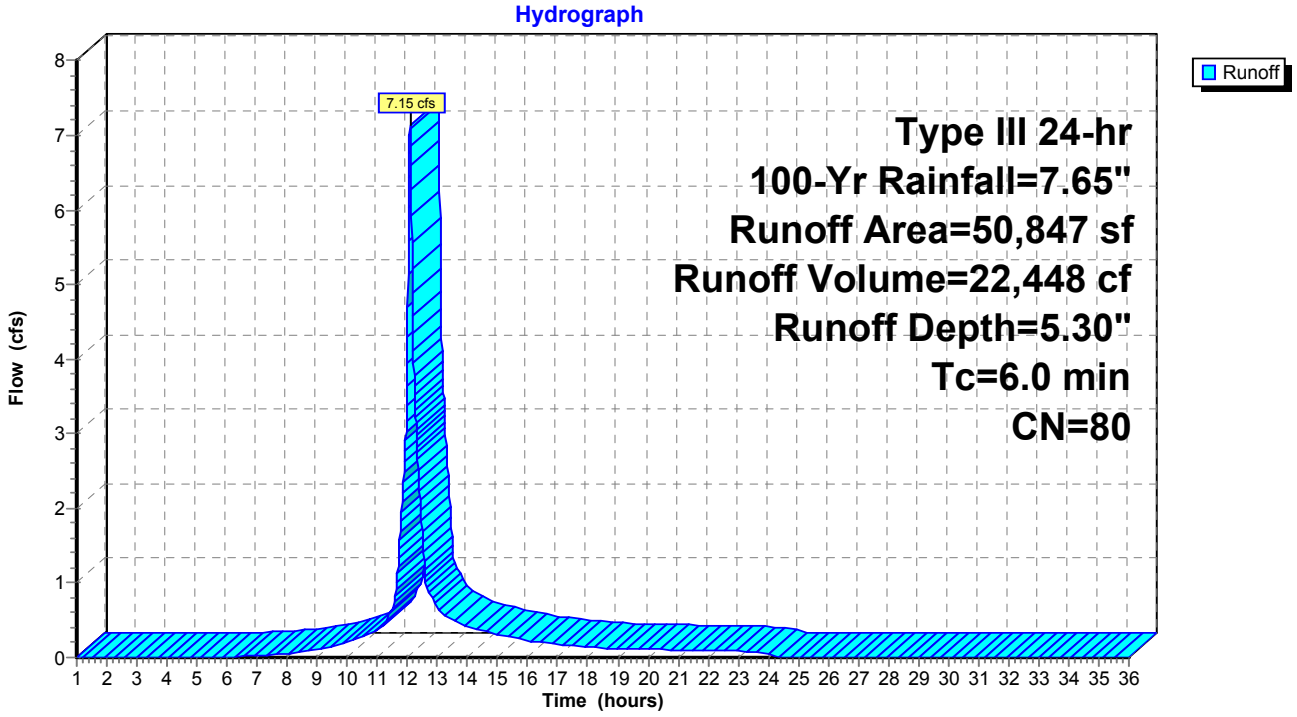
Runoff = 7.15 cfs @ 12.09 hrs, Volume= 22,448 cf, Depth= 5.30"
Routed to Pond B : POI-B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.65"

	Area (sf)	CN	Description
	36,640	74	>75% Grass cover, Good, HSG C
*	8,768	98	Impervious, HSG C
*	4,361	91	Sand, HSG C
	624	70	Woods, Good, HSG C
*	454	89	Gravel, HSG C
	50,847	80	Weighted Average
	42,079		82.76% Pervious Area
	8,768		17.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment B1: SUB-B1

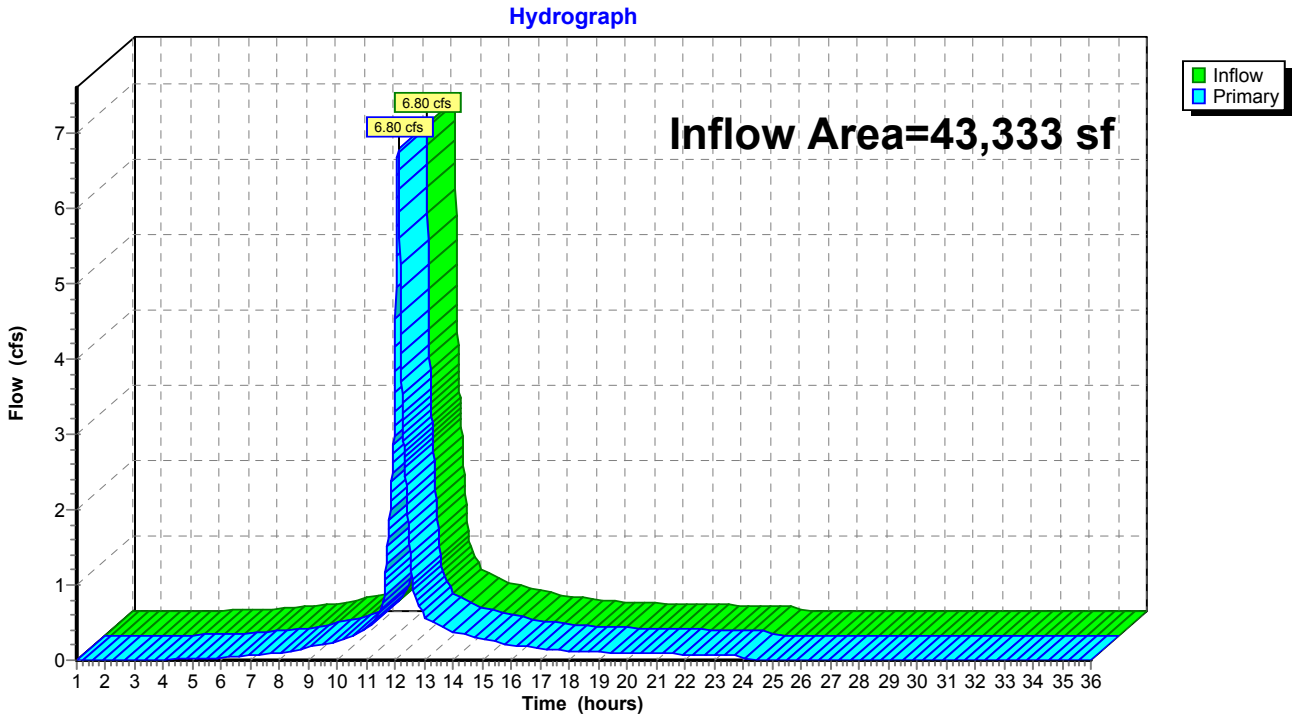


Summary for Pond A: POI-A

Inflow Area = 43,333 sf, 55.55% Impervious, Inflow Depth = 6.16" for 100-Yr event
Inflow = 6.80 cfs @ 12.09 hrs, Volume= 22,246 cf
Primary = 6.80 cfs @ 12.09 hrs, Volume= 22,246 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond A: POI-A

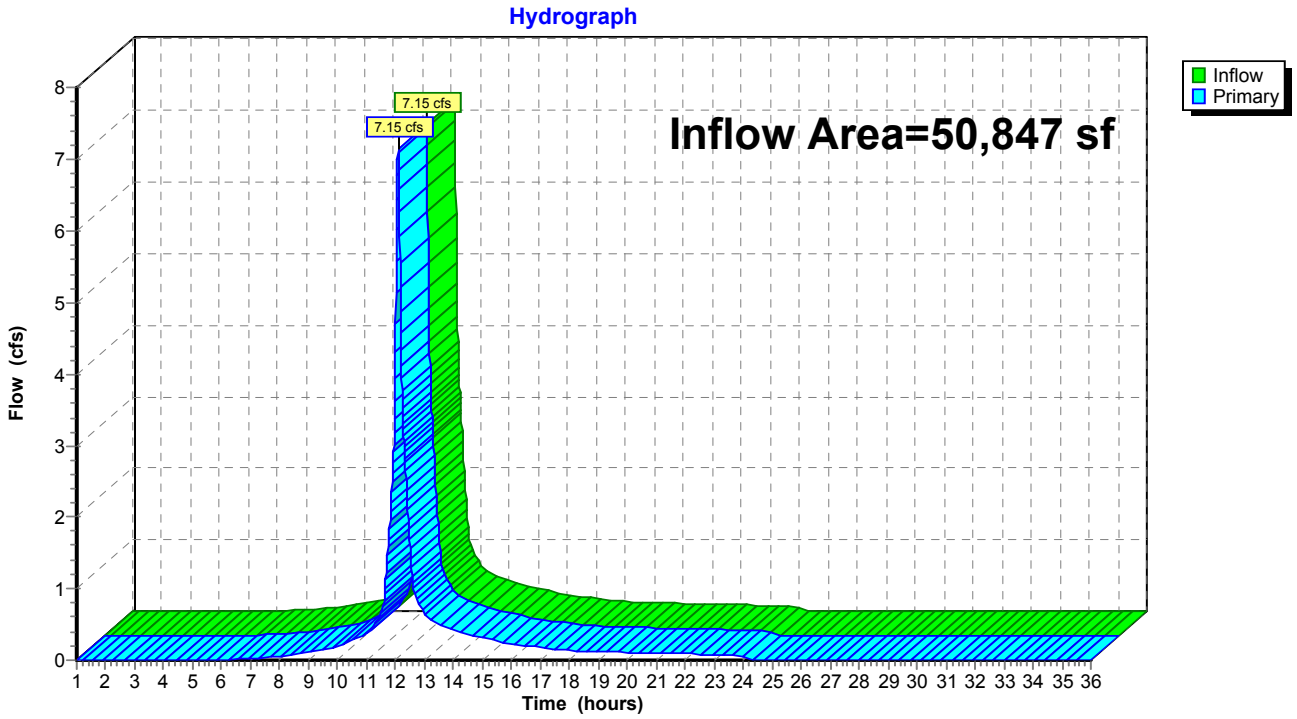


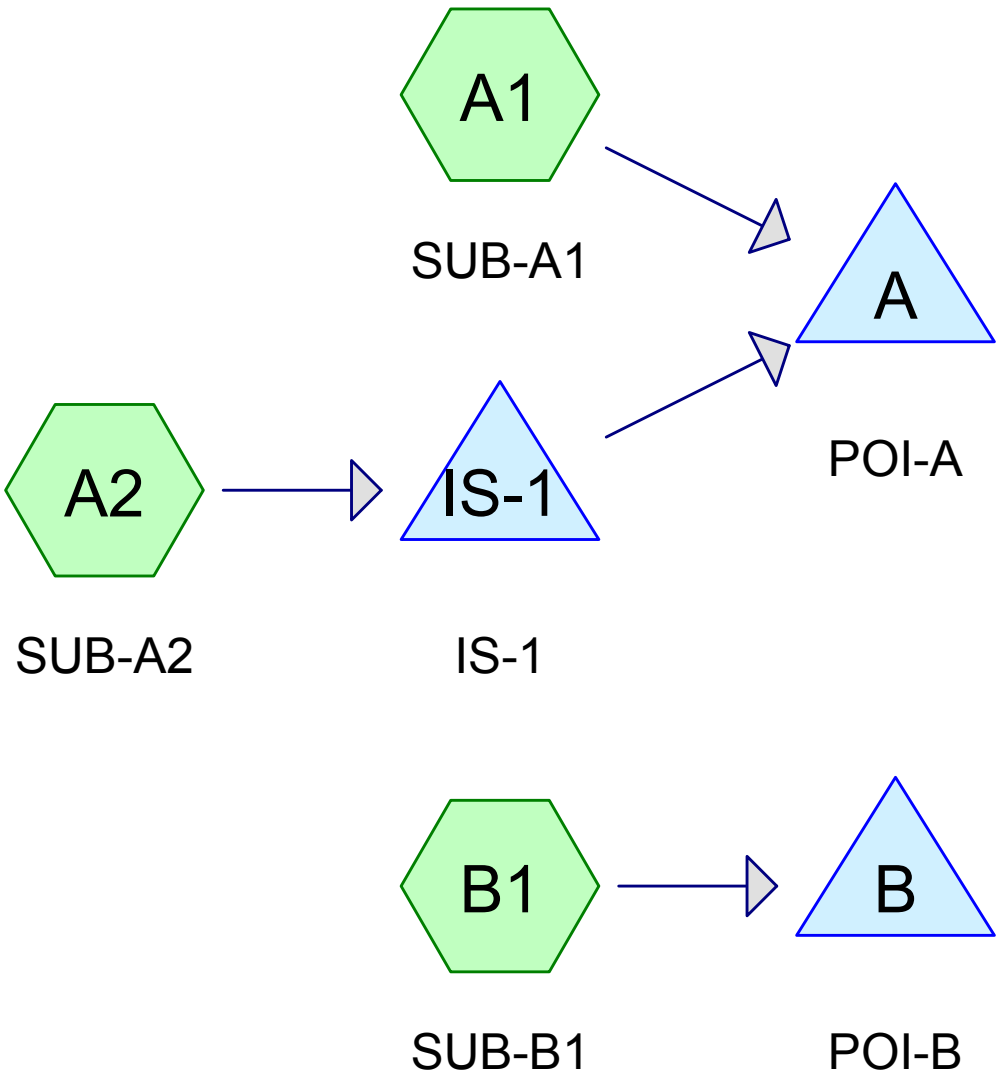
Summary for Pond B: POI-B

Inflow Area = 50,847 sf, 17.24% Impervious, Inflow Depth = 5.30" for 100-Yr event
Inflow = 7.15 cfs @ 12.09 hrs, Volume= 22,448 cf
Primary = 7.15 cfs @ 12.09 hrs, Volume= 22,448 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond B: POI-B





Subcat Reach Pond Link

Routing Diagram for PR-HydroCAD
Prepared by Weston & Sampson Engineers, Inc, Printed 3/16/2023

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Yr	Type III 24-hr		Default	24.00	1	3.18	2
2	10-Yr	Type III 24-hr		Default	24.00	1	4.91	2
3	25-Yr	Type III 24-hr		Default	24.00	1	5.99	2
4	100-Yr	Type III 24-hr		Default	24.00	1	7.65	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
46,846	74	>75% Grass cover, Good, HSG C (A1, A2, B1)
1,787	89	Gravel, HSG C (A1, B1)
40,607	98	Impervious, HSG C (A1, A2, B1)
4,913	91	Sand, HSG C (B1)
27	70	Woods, Good, HSG C (B1)
94,180	**86**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
94,180	HSG C	A1, A2, B1
0	HSG D	
0	Other	
94,180		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
0	0	46,846	0	0	46,846	>75% Grass cover, Good	
0	0	1,787	0	0	1,787	Gravel	
0	0	40,607	0	0	40,607	Impervious	
0	0	4,913	0	0	4,913	Sand	
0	0	27	0	0	27	Woods, Good	
0	**0**	**94,180**	**0**	**0**	**94,180**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	IS-1	668.00	667.63	74.9	0.0049	0.013	0.0	12.0	0.0

Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=18,694 sf 22.67% Impervious Runoff Depth=1.45"
Tc=6.0 min CN=81 Runoff=0.73 cfs 2,264 cf

SubcatchmentA2: SUB-A2 Runoff Area=29,410 sf 91.86% Impervious Runoff Depth=2.73"
Tc=6.0 min CN=96 Runoff=2.01 cfs 6,689 cf

SubcatchmentB1: SUB-B1 Runoff Area=46,076 sf 20.30% Impervious Runoff Depth=1.45"
Tc=6.0 min CN=81 Runoff=1.79 cfs 5,580 cf

Pond A: POI-A Inflow=1.84 cfs 6,798 cf
Primary=1.84 cfs 6,798 cf

Pond B: POI-B Inflow=1.79 cfs 5,580 cf
Primary=1.79 cfs 5,580 cf

Pond IS-1: IS-1 Peak Elev=669.28' Storage=2,225 cf Inflow=2.01 cfs 6,689 cf
Discarded=0.01 cfs 1,337 cf Primary=1.23 cfs 4,534 cf Outflow=1.24 cfs 5,871 cf

Total Runoff Area = 94,180 sf Runoff Volume = 14,534 cf Average Runoff Depth = 1.85"
56.88% Pervious = 53,573 sf 43.12% Impervious = 40,607 sf

Summary for Subcatchment A1: SUB-A1

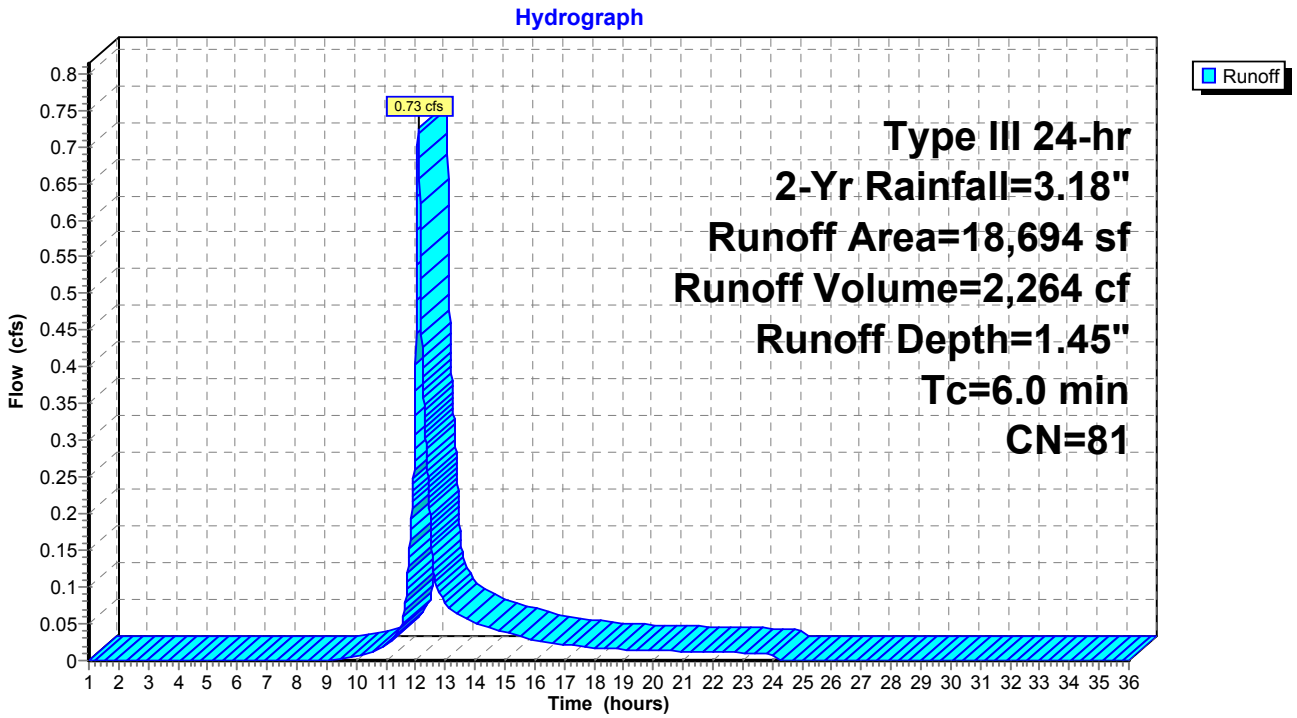
Runoff = 0.73 cfs @ 12.09 hrs, Volume= 2,264 cf, Depth= 1.45"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.18"

	Area (sf)	CN	Description
	12,754	74	>75% Grass cover, Good, HSG C
*	4,238	98	Impervious, HSG C
*	1,702	89	Gravel, HSG C
	18,694	81	Weighted Average
	14,456		77.33% Pervious Area
	4,238		22.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

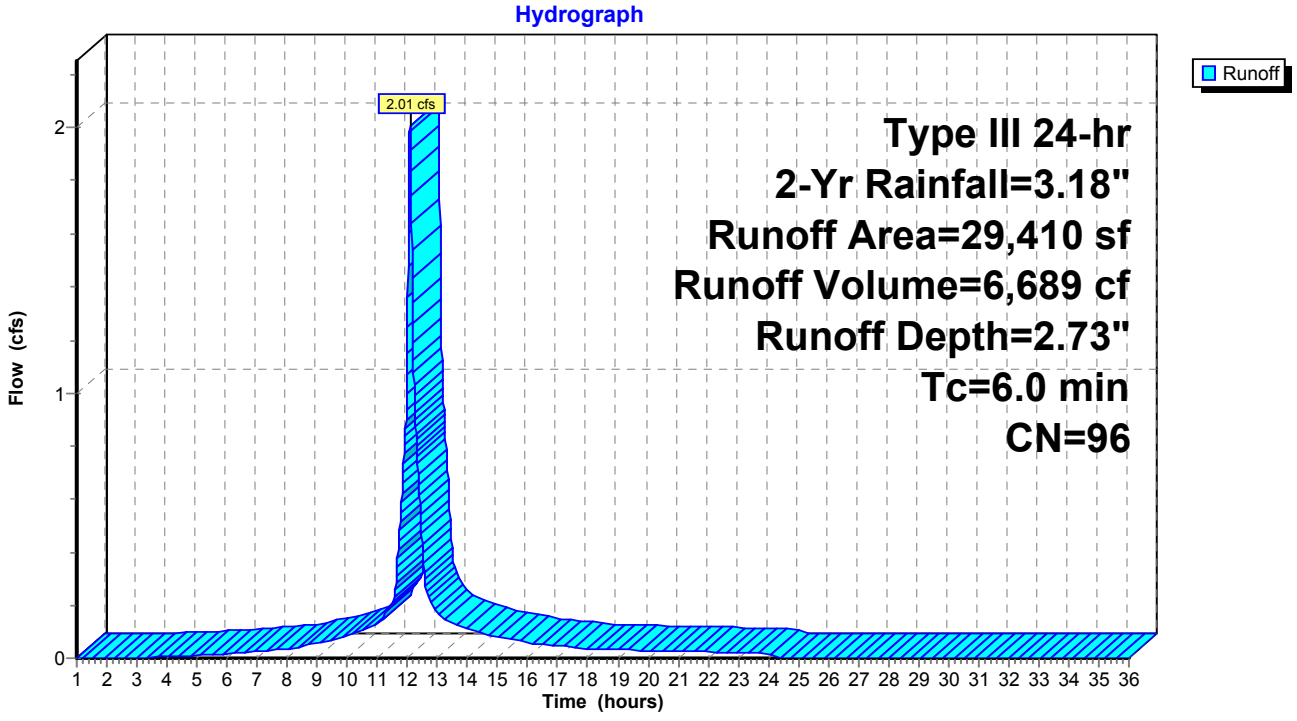
Runoff = 2.01 cfs @ 12.08 hrs, Volume= 6,689 cf, Depth= 2.73"
Routed to Pond IS-1 : IS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.18"

	Area (sf)	CN	Description
*	27,017	98	Impervious, HSG C
	2,393	74	>75% Grass cover, Good, HSG C
	29,410	96	Weighted Average
	2,393		8.14% Pervious Area
	27,017		91.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment A2: SUB-A2



Summary for Subcatchment B1: SUB-B1

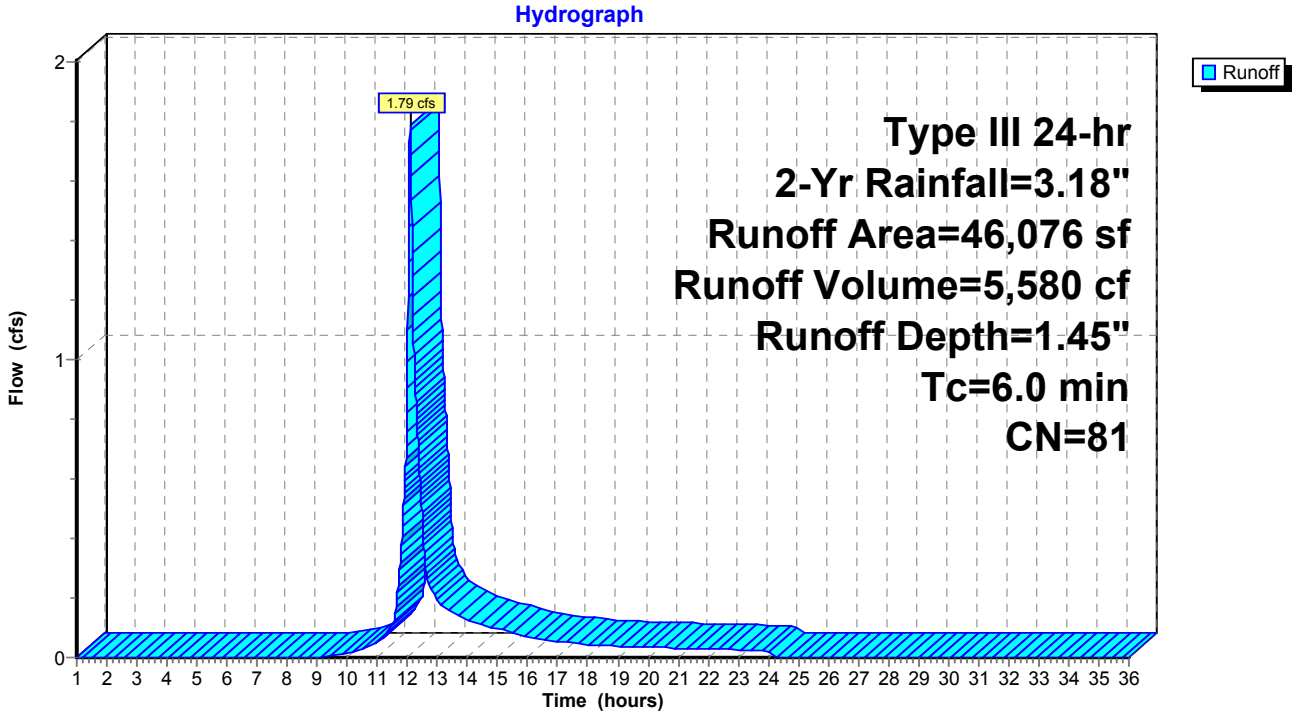
Runoff = 1.79 cfs @ 12.09 hrs, Volume= 5,580 cf, Depth= 1.45"
Routed to Pond B : POI-B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.18"

	Area (sf)	CN	Description
	31,699	74	>75% Grass cover, Good, HSG C
*	9,352	98	Impervious, HSG C
*	4,913	91	Sand, HSG C
*	85	89	Gravel, HSG C
	27	70	Woods, Good, HSG C
	46,076	81	Weighted Average
	36,724		79.70% Pervious Area
	9,352		20.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment B1: SUB-B1

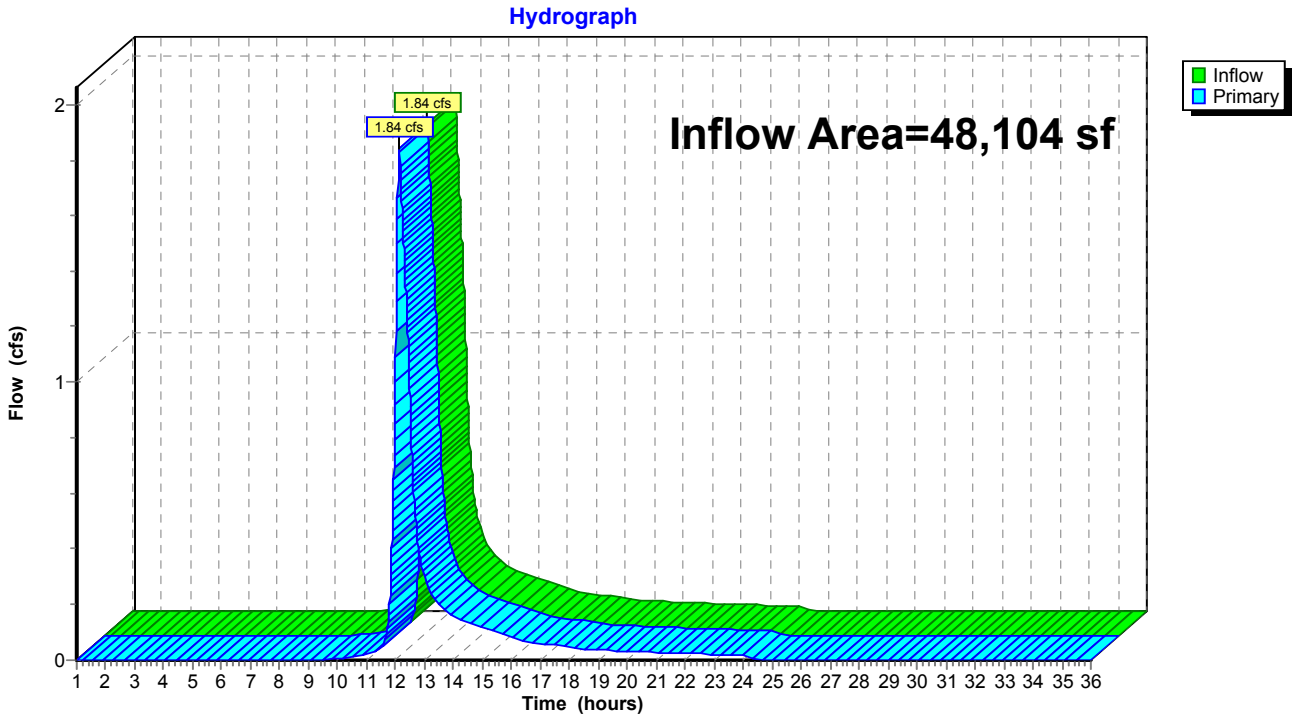


Summary for Pond A: POI-A

Inflow Area = 48,104 sf, 64.97% Impervious, Inflow Depth = 1.70" for 2-Yr event
Inflow = 1.84 cfs @ 12.12 hrs, Volume= 6,798 cf
Primary = 1.84 cfs @ 12.12 hrs, Volume= 6,798 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond A: POI-A

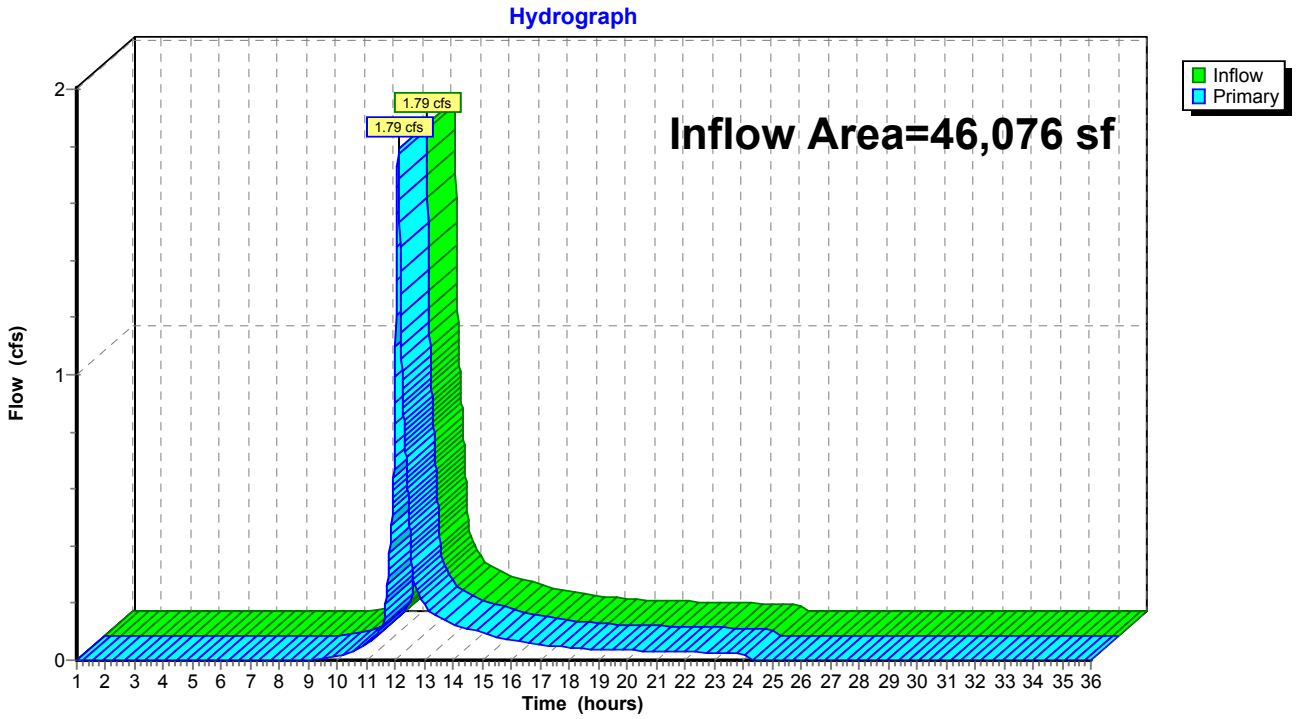


Summary for Pond B: POI-B

Inflow Area = 46,076 sf, 20.30% Impervious, Inflow Depth = 1.45" for 2-Yr event
Inflow = 1.79 cfs @ 12.09 hrs, Volume= 5,580 cf
Primary = 1.79 cfs @ 12.09 hrs, Volume= 5,580 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond B: POI-B



Summary for Pond IS-1: IS-1

Inflow Area = 29,410 sf, 91.86% Impervious, Inflow Depth = 2.73" for 2-Yr event
Inflow = 2.01 cfs @ 12.08 hrs, Volume= 6,689 cf
Outflow = 1.24 cfs @ 12.18 hrs, Volume= 5,871 cf, Atten= 38%, Lag= 5.9 min
Discarded = 0.01 cfs @ 6.85 hrs, Volume= 1,337 cf
Primary = 1.23 cfs @ 12.18 hrs, Volume= 4,534 cf
Routed to Pond A : POI-A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 669.28' @ 12.18 hrs Surf.Area= 1,858 sf Storage= 2,225 cf

Plug-Flow detention time= 191.5 min calculated for 5,869 cf (88% of inflow)
Center-of-Mass det. time= 135.7 min (909.9 - 774.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	667.50'	1,700 cf	**34.75'W x 53.46'L x 3.50'H Field A** 6,502 cf Overall - 2,251 cf Embedded = 4,251 cf x 40.0% Voids
#2A	668.00'	2,251 cf	**ADS_StormTech SC-740 +Cap** x 49 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 49 Chambers in 7 Rows
		3,951 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	667.50'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	668.00'	**12.0" Round Culvert** L= 74.9' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 668.00' / 667.63' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	668.60'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#4	Device 2	670.75'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.01 cfs @ 6.85 hrs HW=667.54' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.23 cfs @ 12.18 hrs HW=669.28' TW=0.00' (Dynamic Tailwater)
└**2=Culvert** (Passes 1.23 cfs of 2.61 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 1.23 cfs @ 3.14 fps)
  └**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IS-1: IS-1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

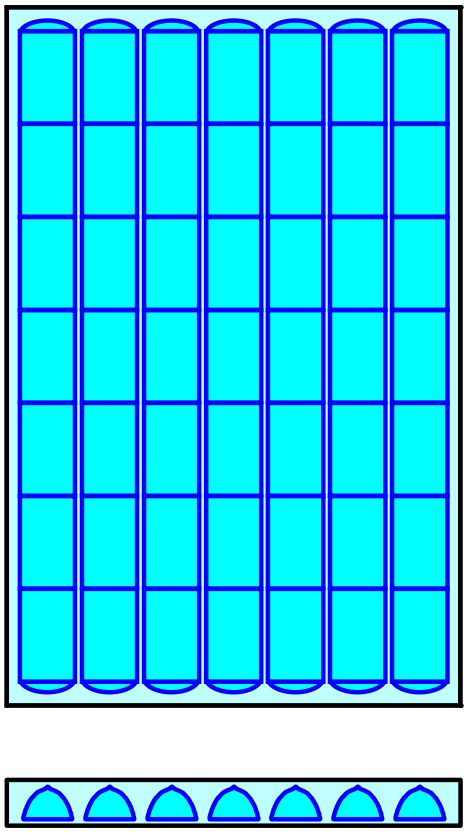
7 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 51.46' Row Length +12.0" End Stone x 2 = 53.46' Base Length
7 Rows x 51.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 34.75' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

49 Chambers x 45.9 cf = 2,251.1 cf Chamber Storage

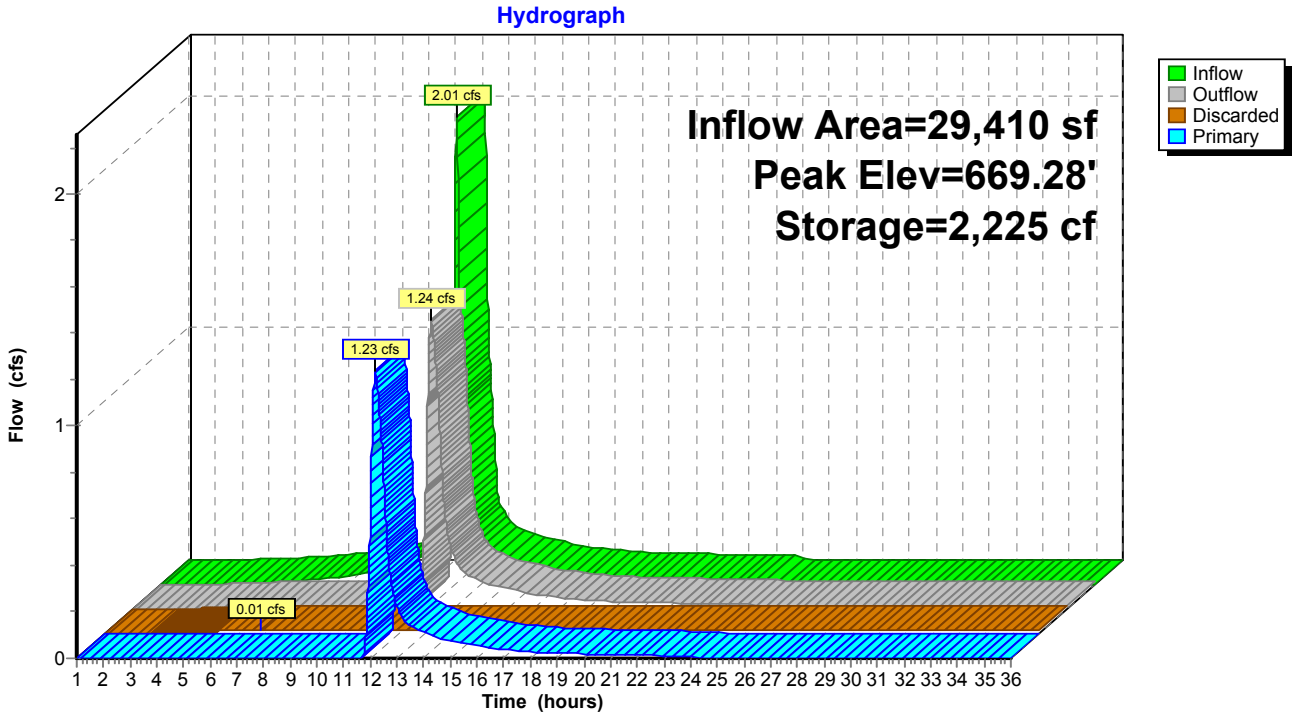
6,501.7 cf Field - 2,251.1 cf Chambers = 4,250.6 cf Stone x 40.0% Voids = 1,700.2 cf Stone Storage

Chamber Storage + Stone Storage = 3,951.3 cf = 0.091 af
Overall Storage Efficiency = 60.8%
Overall System Size = 53.46' x 34.75' x 3.50'

49 Chambers
240.8 cy Field
157.4 cy Stone



Pond IS-1: IS-1


Hydrograph
Inflow Area=29,410 sf
Peak Elev=669.28'
Storage=2,225 cf
2.01 cfs
1.24 cfs
1.23 cfs
0.01 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
0
1
2
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Time (hours)

Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=18,694 sf 22.67% Impervious Runoff Depth=2.91"
Tc=6.0 min CN=81 Runoff=1.46 cfs 4,527 cf

SubcatchmentA2: SUB-A2 Runoff Area=29,410 sf 91.86% Impervious Runoff Depth=4.44"
Tc=6.0 min CN=96 Runoff=3.19 cfs 10,889 cf

SubcatchmentB1: SUB-B1 Runoff Area=46,076 sf 20.30% Impervious Runoff Depth=2.91"
Tc=6.0 min CN=81 Runoff=3.60 cfs 11,158 cf

Pond A: POI-A Inflow=3.07 cfs 13,187 cf
Primary=3.07 cfs 13,187 cf

Pond B: POI-B Inflow=3.60 cfs 11,158 cf
Primary=3.60 cfs 11,158 cf

Pond IS-1: IS-1 Peak Elev=669.78' Storage=2,865 cf Inflow=3.19 cfs 10,889 cf
Discarded=0.01 cfs 1,398 cf Primary=1.82 cfs 8,660 cf Outflow=1.83 cfs 10,058 cf

Total Runoff Area = 94,180 sf Runoff Volume = 26,574 cf Average Runoff Depth = 3.39"
56.88% Pervious = 53,573 sf 43.12% Impervious = 40,607 sf

Summary for Subcatchment A1: SUB-A1

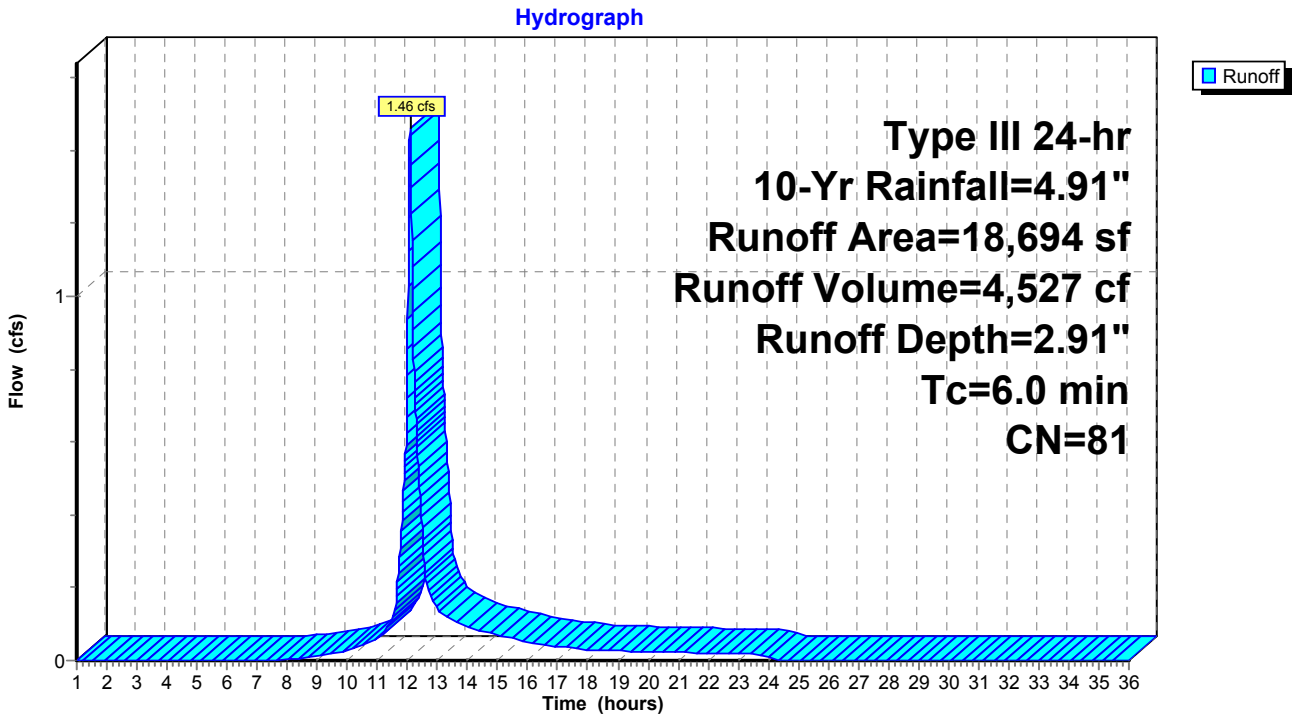
Runoff = 1.46 cfs @ 12.09 hrs, Volume= 4,527 cf, Depth= 2.91"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=4.91"

	Area (sf)	CN	Description
	12,754	74	>75% Grass cover, Good, HSG C
*	4,238	98	Impervious, HSG C
*	1,702	89	Gravel, HSG C
	18,694	81	Weighted Average
	14,456		77.33% Pervious Area
	4,238		22.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

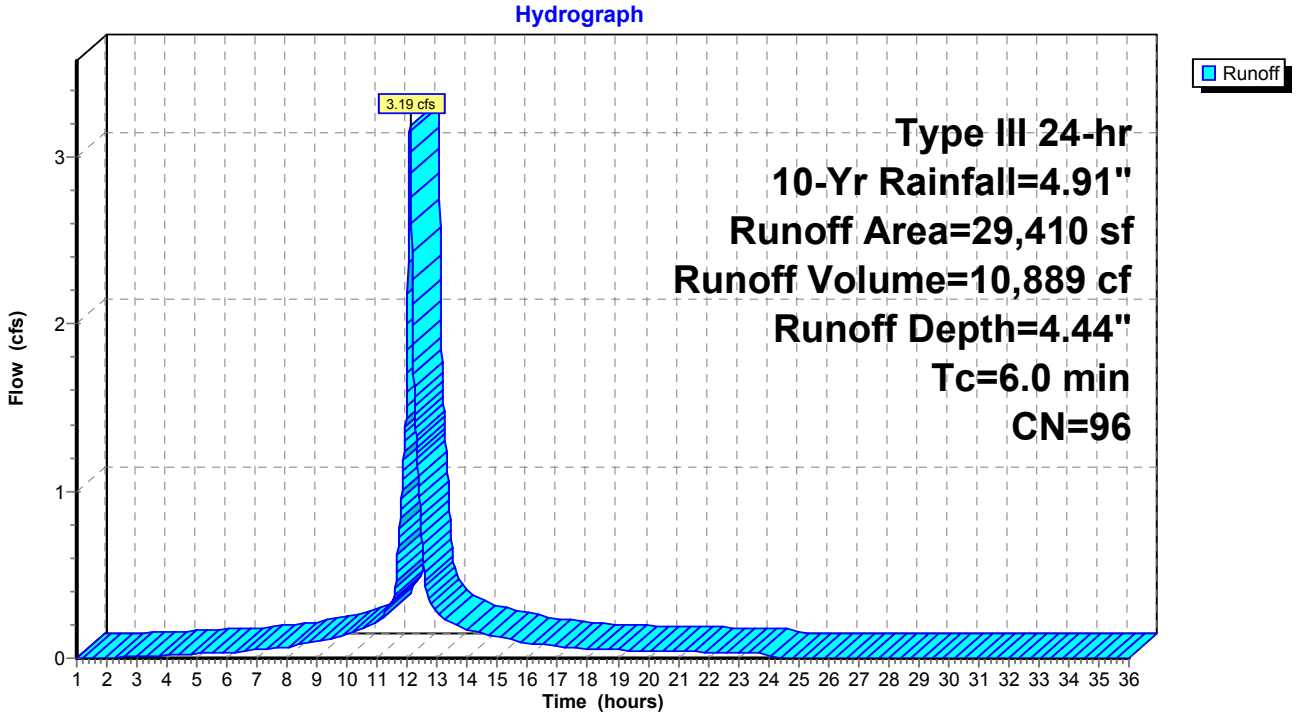
Runoff = 3.19 cfs @ 12.08 hrs, Volume= 10,889 cf, Depth= 4.44"
Routed to Pond IS-1 : IS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=4.91"

	Area (sf)	CN	Description
*	27,017	98	Impervious, HSG C
	2,393	74	>75% Grass cover, Good, HSG C
	29,410	96	Weighted Average
	2,393		8.14% Pervious Area
	27,017		91.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment A2: SUB-A2



Summary for Subcatchment B1: SUB-B1

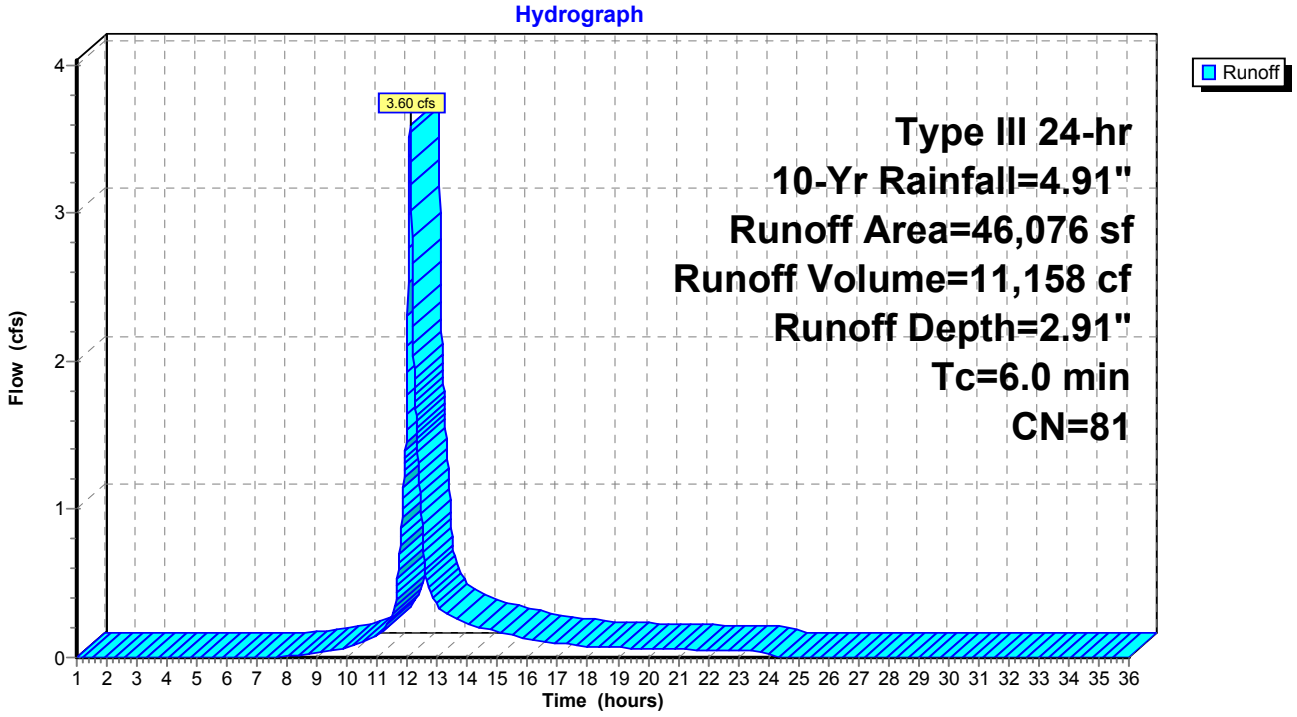
Runoff = 3.60 cfs @ 12.09 hrs, Volume= 11,158 cf, Depth= 2.91"
Routed to Pond B : POI-B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=4.91"

	Area (sf)	CN	Description
	31,699	74	>75% Grass cover, Good, HSG C
*	9,352	98	Impervious, HSG C
*	4,913	91	Sand, HSG C
*	85	89	Gravel, HSG C
	27	70	Woods, Good, HSG C
	46,076	81	Weighted Average
	36,724		79.70% Pervious Area
	9,352		20.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment B1: SUB-B1

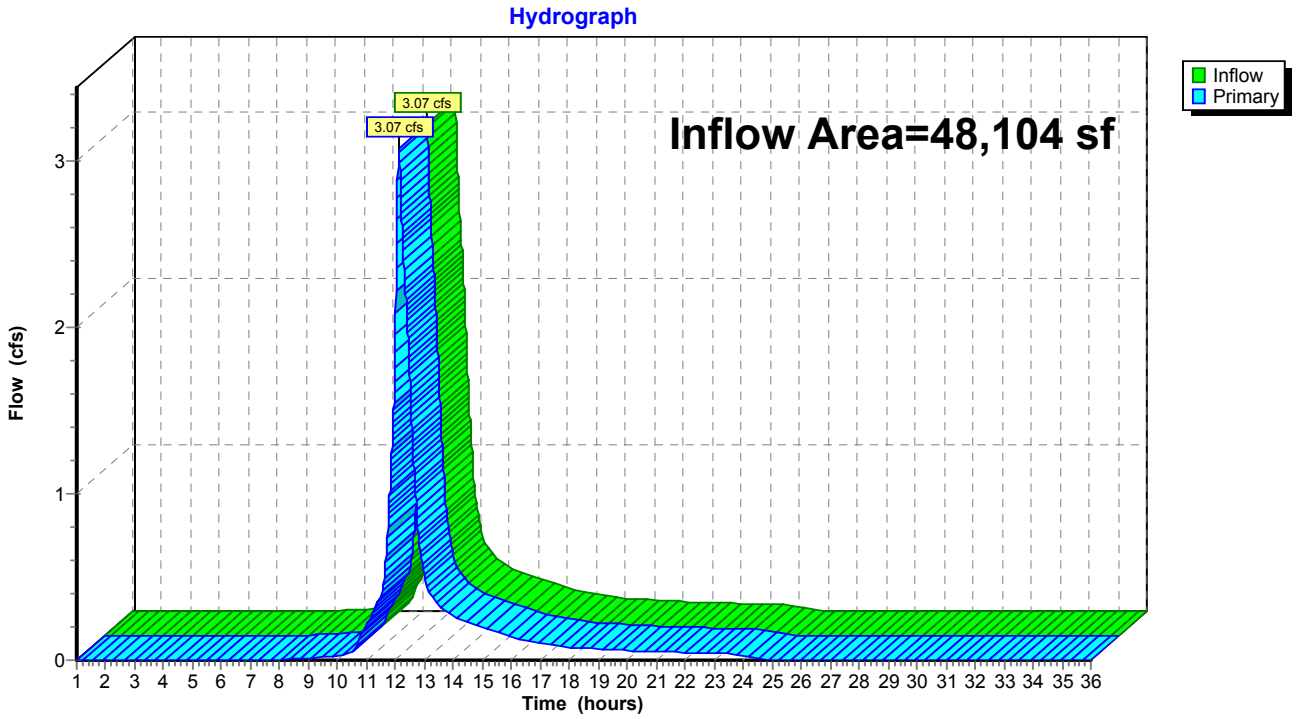


Summary for Pond A: POI-A

Inflow Area = 48,104 sf, 64.97% Impervious, Inflow Depth = 3.29" for 10-Yr event
Inflow = 3.07 cfs @ 12.11 hrs, Volume= 13,187 cf
Primary = 3.07 cfs @ 12.11 hrs, Volume= 13,187 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond A: POI-A

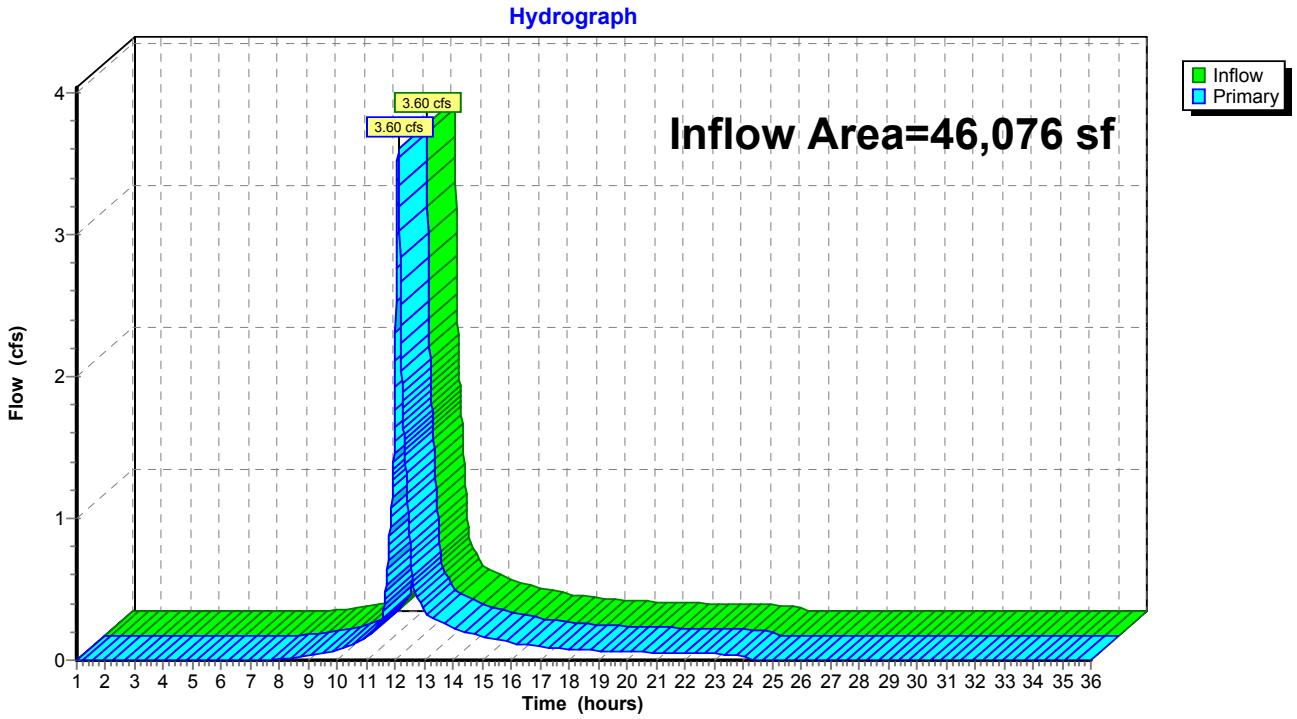


Summary for Pond B: POI-B

Inflow Area = 46,076 sf, 20.30% Impervious, Inflow Depth = 2.91" for 10-Yr event
Inflow = 3.60 cfs @ 12.09 hrs, Volume= 11,158 cf
Primary = 3.60 cfs @ 12.09 hrs, Volume= 11,158 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond B: POI-B



Summary for Pond IS-1: IS-1

Inflow Area = 29,410 sf, 91.86% Impervious, Inflow Depth = 4.44" for 10-Yr event
Inflow = 3.19 cfs @ 12.08 hrs, Volume= 10,889 cf
Outflow = 1.83 cfs @ 12.19 hrs, Volume= 10,058 cf, Atten= 43%, Lag= 6.6 min
Discarded = 0.01 cfs @ 4.64 hrs, Volume= 1,398 cf
Primary = 1.82 cfs @ 12.19 hrs, Volume= 8,660 cf
Routed to Pond A : POI-A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 669.78' @ 12.19 hrs Surf.Area= 1,858 sf Storage= 2,865 cf

Plug-Flow detention time= 137.5 min calculated for 10,055 cf (92% of inflow)
Center-of-Mass det. time= 97.3 min (860.1 - 762.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	667.50'	1,700 cf	**34.75'W x 53.46'L x 3.50'H Field A** 6,502 cf Overall - 2,251 cf Embedded = 4,251 cf x 40.0% Voids
#2A	668.00'	2,251 cf	**ADS_StormTech SC-740 +Cap** x 49 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 49 Chambers in 7 Rows
		3,951 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	667.50'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	668.00'	**12.0" Round Culvert** L= 74.9' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 668.00' / 667.63' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	668.60'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#4	Device 2	670.75'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.01 cfs @ 4.64 hrs HW=667.54' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.82 cfs @ 12.19 hrs HW=669.77' TW=0.00' (Dynamic Tailwater)
└**2=Culvert** (Passes 1.82 cfs of 3.27 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 1.82 cfs @ 4.63 fps)
  └**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IS-1: IS-1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

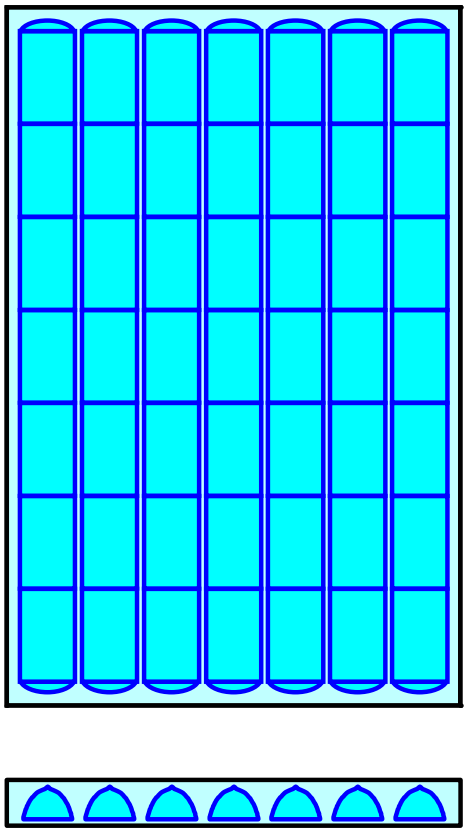
7 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 51.46' Row Length +12.0" End Stone x 2 = 53.46' Base Length
7 Rows x 51.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 34.75' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

49 Chambers x 45.9 cf = 2,251.1 cf Chamber Storage

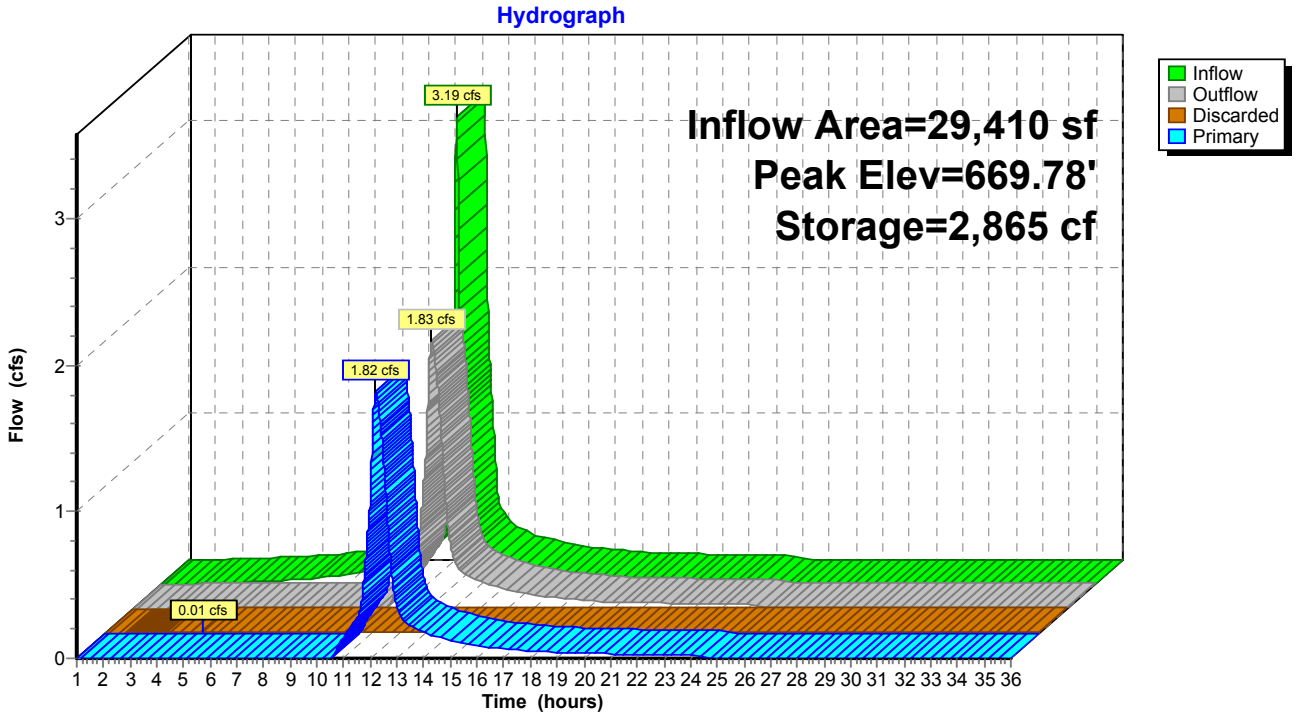
6,501.7 cf Field - 2,251.1 cf Chambers = 4,250.6 cf Stone x 40.0% Voids = 1,700.2 cf Stone Storage

Chamber Storage + Stone Storage = 3,951.3 cf = 0.091 af
Overall Storage Efficiency = 60.8%
Overall System Size = 53.46' x 34.75' x 3.50'

49 Chambers
240.8 cy Field
157.4 cy Stone



Pond IS-1: IS-1


Hydrograph
Inflow Area=29,410 sf
Peak Elev=669.78'
Storage=2,865 cf
3.19 cfs
1.83 cfs
1.82 cfs
0.01 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
0
1
2
3
Time (hours)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=18,694 sf 22.67% Impervious Runoff Depth=3.87"
Tc=6.0 min CN=81 Runoff=1.94 cfs 6,036 cf

SubcatchmentA2: SUB-A2 Runoff Area=29,410 sf 91.86% Impervious Runoff Depth=5.52"
Tc=6.0 min CN=96 Runoff=3.92 cfs 13,522 cf

SubcatchmentB1: SUB-B1 Runoff Area=46,076 sf 20.30% Impervious Runoff Depth=3.87"
Tc=6.0 min CN=81 Runoff=4.78 cfs 14,877 cf

Pond A: POI-A Inflow=3.81 cfs 17,303 cf
Primary=3.81 cfs 17,303 cf

Pond B: POI-B Inflow=4.78 cfs 14,877 cf
Primary=4.78 cfs 14,877 cf

Pond IS-1: IS-1 Peak Elev=670.15' Storage=3,279 cf Inflow=3.92 cfs 13,522 cf
Discarded=0.01 cfs 1,420 cf Primary=2.15 cfs 11,267 cf Outflow=2.17 cfs 12,687 cf

Total Runoff Area = 94,180 sf Runoff Volume = 34,436 cf Average Runoff Depth = 4.39"
56.88% Pervious = 53,573 sf 43.12% Impervious = 40,607 sf

Summary for Subcatchment A1: SUB-A1

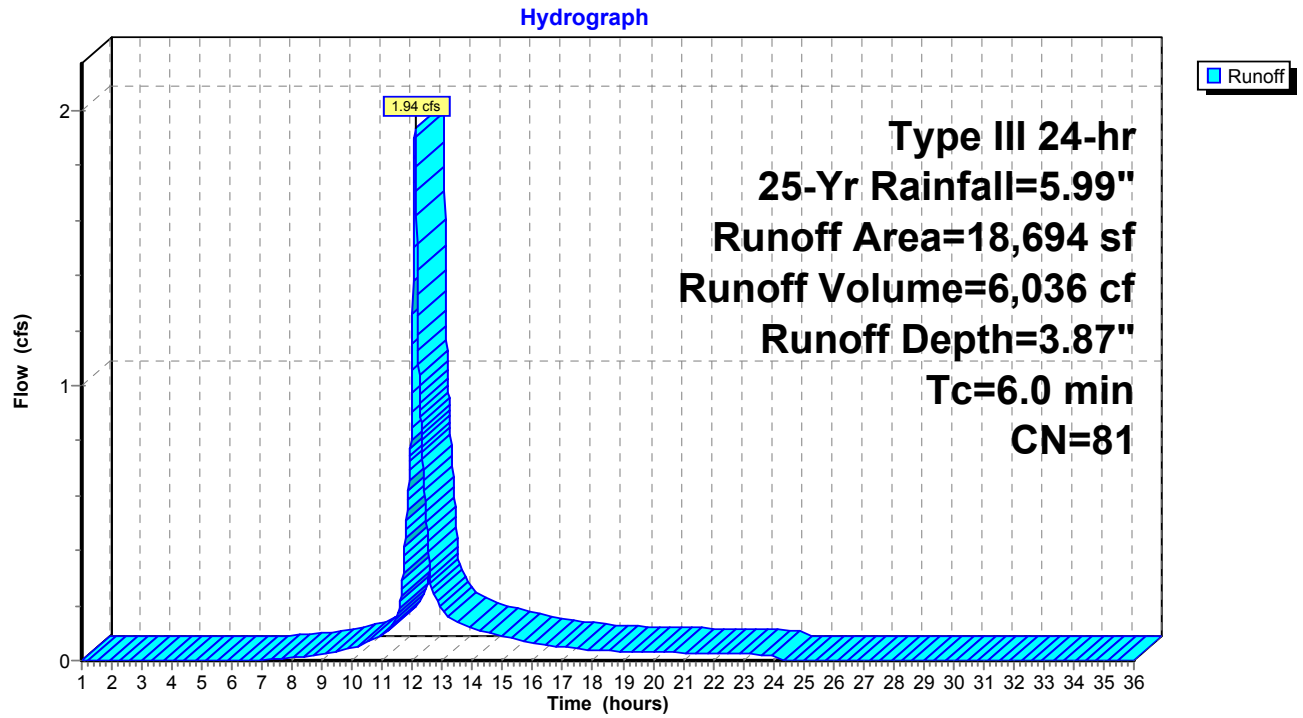
Runoff = 1.94 cfs @ 12.09 hrs, Volume= 6,036 cf, Depth= 3.87"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=5.99"

	Area (sf)	CN	Description
	12,754	74	>75% Grass cover, Good, HSG C
*	4,238	98	Impervious, HSG C
*	1,702	89	Gravel, HSG C
	18,694	81	Weighted Average
	14,456		77.33% Pervious Area
	4,238		22.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

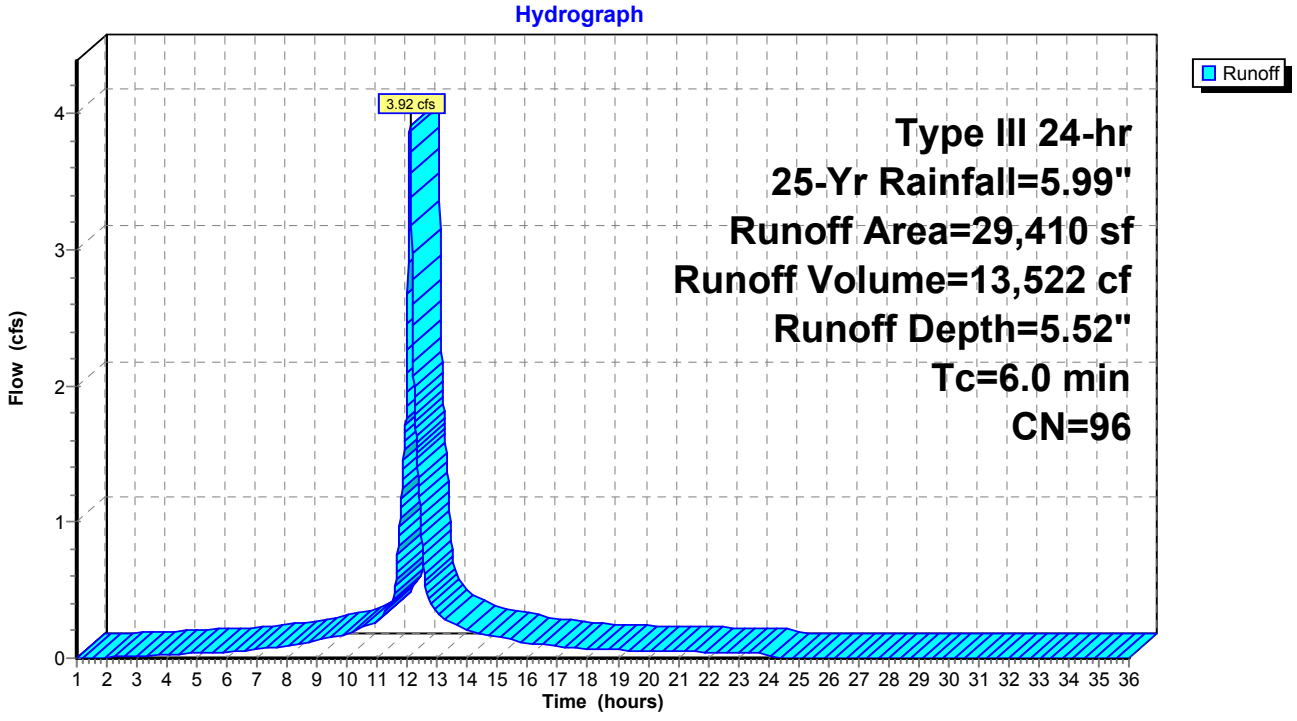
Runoff = 3.92 cfs @ 12.08 hrs, Volume= 13,522 cf, Depth= 5.52"
Routed to Pond IS-1 : IS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=5.99"

	Area (sf)	CN	Description
*	27,017	98	Impervious, HSG C
	2,393	74	>75% Grass cover, Good, HSG C
	29,410	96	Weighted Average
	2,393		8.14% Pervious Area
	27,017		91.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment A2: SUB-A2



Summary for Subcatchment B1: SUB-B1

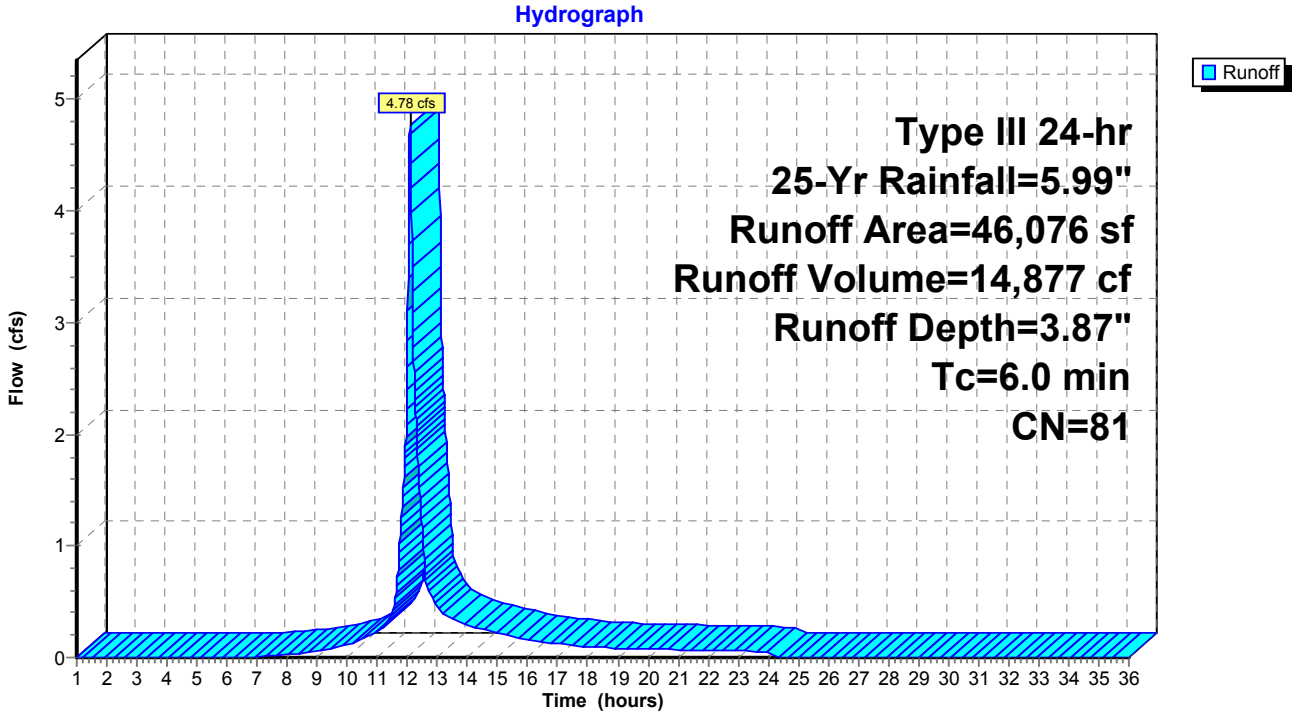
Runoff = 4.78 cfs @ 12.09 hrs, Volume= 14,877 cf, Depth= 3.87"
Routed to Pond B : POI-B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=5.99"

	Area (sf)	CN	Description
	31,699	74	>75% Grass cover, Good, HSG C
*	9,352	98	Impervious, HSG C
*	4,913	91	Sand, HSG C
*	85	89	Gravel, HSG C
	27	70	Woods, Good, HSG C
	46,076	81	Weighted Average
	36,724		79.70% Pervious Area
	9,352		20.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment B1: SUB-B1

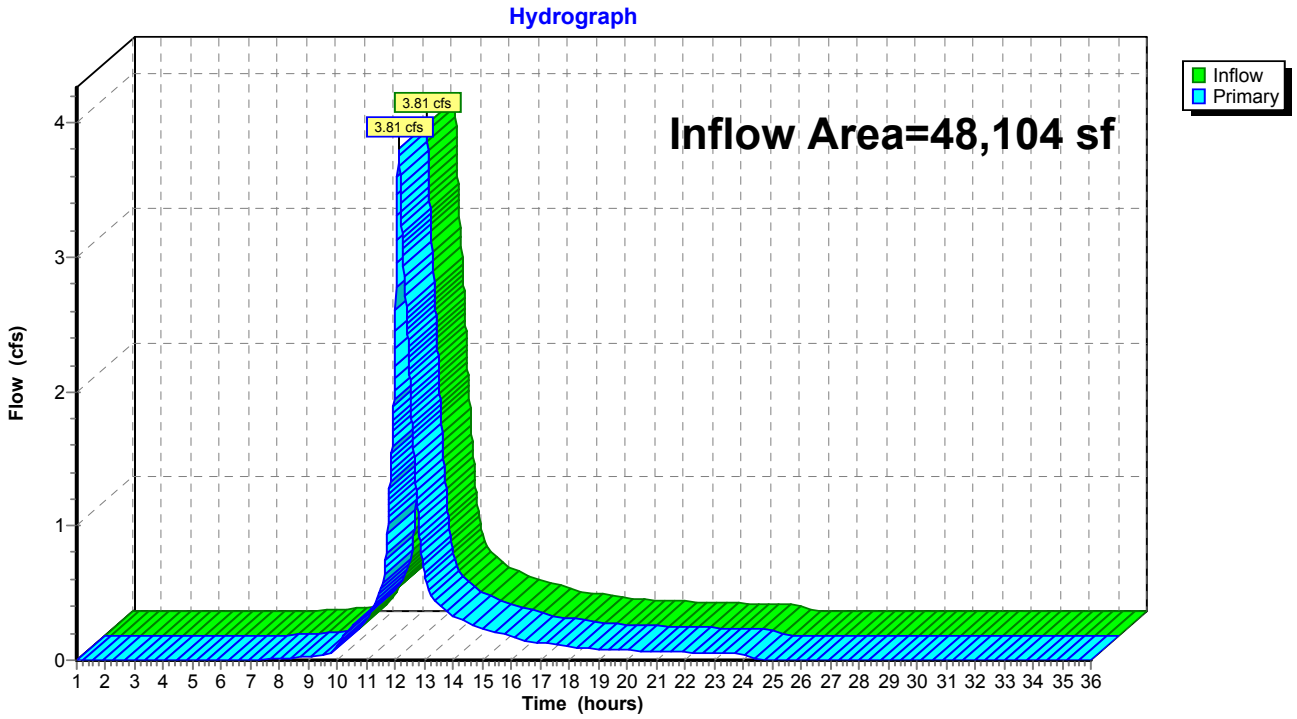


Summary for Pond A: POI-A

Inflow Area = 48,104 sf, 64.97% Impervious, Inflow Depth = 4.32" for 25-Yr event
Inflow = 3.81 cfs @ 12.11 hrs, Volume= 17,303 cf
Primary = 3.81 cfs @ 12.11 hrs, Volume= 17,303 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond A: POI-A

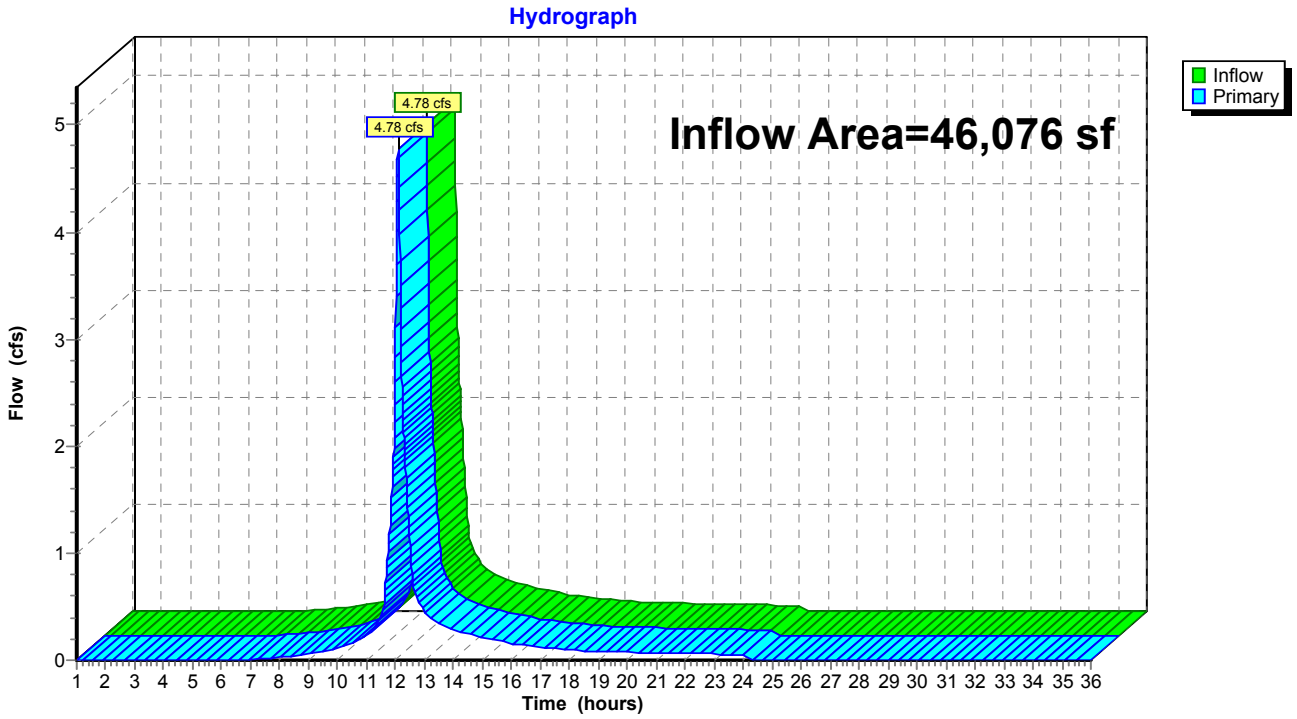


Summary for Pond B: POI-B

Inflow Area = 46,076 sf, 20.30% Impervious, Inflow Depth = 3.87" for 25-Yr event
Inflow = 4.78 cfs @ 12.09 hrs, Volume= 14,877 cf
Primary = 4.78 cfs @ 12.09 hrs, Volume= 14,877 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond B: POI-B



Summary for Pond IS-1: IS-1

Inflow Area = 29,410 sf, 91.86% Impervious, Inflow Depth = 5.52" for 25-Yr event
Inflow = 3.92 cfs @ 12.08 hrs, Volume= 13,522 cf
Outflow = 2.17 cfs @ 12.20 hrs, Volume= 12,687 cf, Atten= 45%, Lag= 7.1 min
Discarded = 0.01 cfs @ 3.81 hrs, Volume= 1,420 cf
Primary = 2.15 cfs @ 12.20 hrs, Volume= 11,267 cf
Routed to Pond A : POI-A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 670.15' @ 12.20 hrs Surf.Area= 1,858 sf Storage= 3,279 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 85.3 min (843.6 - 758.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	667.50'	1,700 cf	**34.75'W x 53.46'L x 3.50'H Field A** 6,502 cf Overall - 2,251 cf Embedded = 4,251 cf x 40.0% Voids
#2A	668.00'	2,251 cf	**ADS_StormTech SC-740 +Cap** x 49 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 49 Chambers in 7 Rows
		3,951 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	667.50'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	668.00'	**12.0" Round Culvert** L= 74.9' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 668.00' / 667.63' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	668.60'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#4	Device 2	670.75'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.01 cfs @ 3.81 hrs HW=667.54' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=2.15 cfs @ 12.20 hrs HW=670.15' TW=0.00' (Dynamic Tailwater)
└**2=Culvert** (Passes 2.15 cfs of 3.76 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 2.15 cfs @ 5.48 fps)
  └**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IS-1: IS-1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

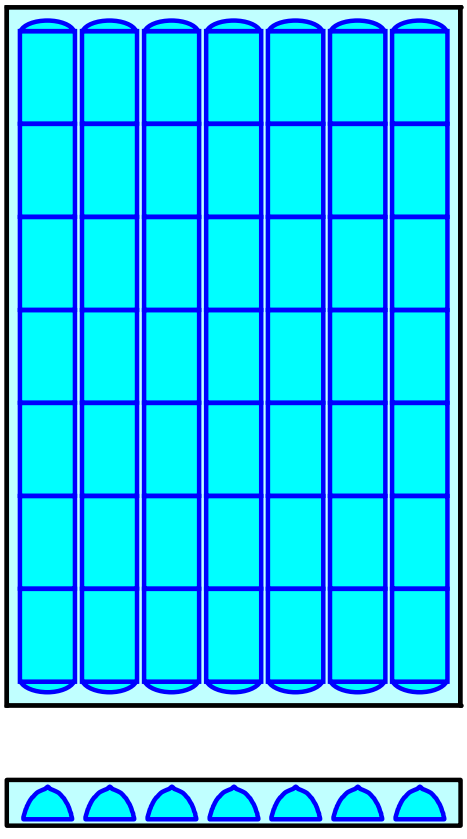
7 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 51.46' Row Length +12.0" End Stone x 2 = 53.46' Base Length
7 Rows x 51.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 34.75' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

49 Chambers x 45.9 cf = 2,251.1 cf Chamber Storage

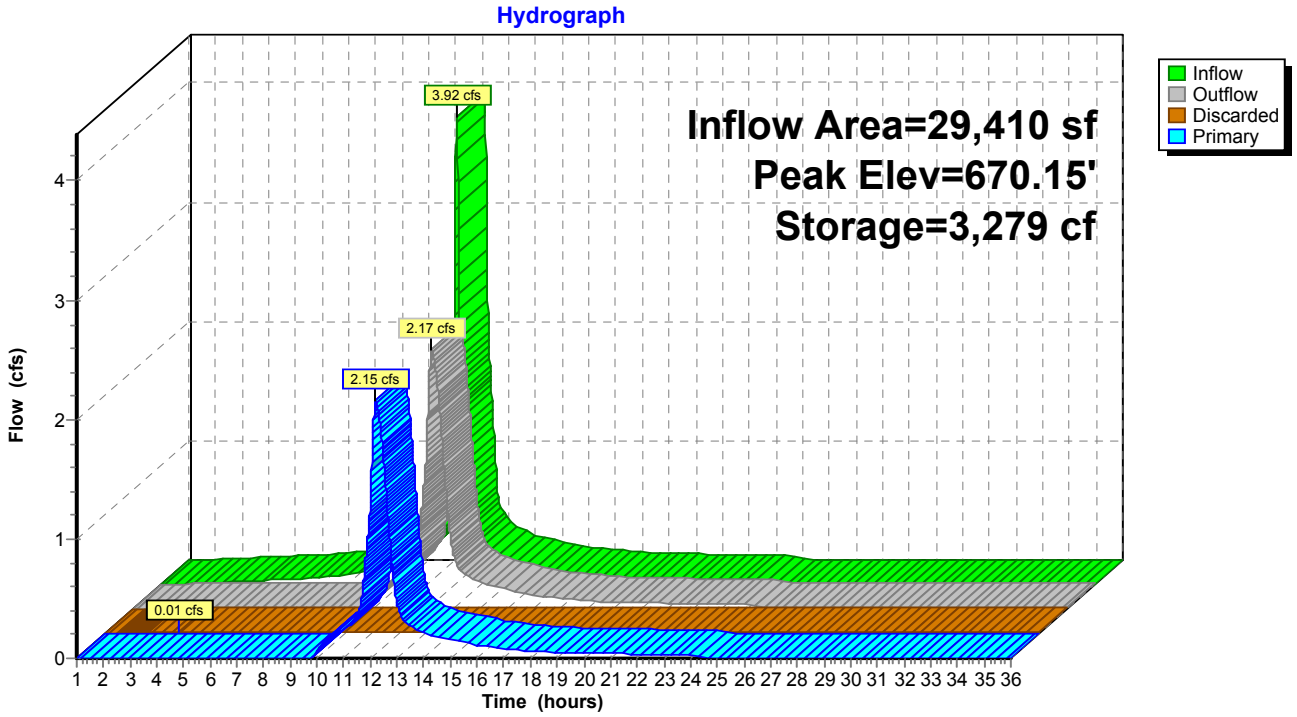
6,501.7 cf Field - 2,251.1 cf Chambers = 4,250.6 cf Stone x 40.0% Voids = 1,700.2 cf Stone Storage

Chamber Storage + Stone Storage = 3,951.3 cf = 0.091 af
Overall Storage Efficiency = 60.8%
Overall System Size = 53.46' x 34.75' x 3.50'

49 Chambers
240.8 cy Field
157.4 cy Stone



Pond IS-1: IS-1


Hydrograph
Inflow Area=29,410 sf
Peak Elev=670.15'
Storage=3,279 cf
Inflow
Outflow
Discarded
Primary
3.92 cfs
2.17 cfs
2.15 cfs
0.01 cfs
Flow (cfs)
0
1
2
3
4
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Time (hours)

Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=18,694 sf 22.67% Impervious Runoff Depth=5.41"
Tc=6.0 min CN=81 Runoff=2.68 cfs 8,432 cf

SubcatchmentA2: SUB-A2 Runoff Area=29,410 sf 91.86% Impervious Runoff Depth=7.17"
Tc=6.0 min CN=96 Runoff=5.03 cfs 17,577 cf

SubcatchmentB1: SUB-B1 Runoff Area=46,076 sf 20.30% Impervious Runoff Depth=5.41"
Tc=6.0 min CN=81 Runoff=6.60 cfs 20,783 cf

Pond A: POI-A Inflow=5.11 cfs 23,727 cf
Primary=5.11 cfs 23,727 cf

Pond B: POI-B Inflow=6.60 cfs 20,783 cf
Primary=6.60 cfs 20,783 cf

Pond IS-1: IS-1 Peak Elev=670.86' Storage=3,846 cf Inflow=5.03 cfs 17,577 cf
Discarded=0.01 cfs 1,441 cf Primary=3.26 cfs 15,295 cf Outflow=3.28 cfs 16,736 cf

Total Runoff Area = 94,180 sf Runoff Volume = 46,792 cf Average Runoff Depth = 5.96"
56.88% Pervious = 53,573 sf 43.12% Impervious = 40,607 sf

Summary for Subcatchment A1: SUB-A1

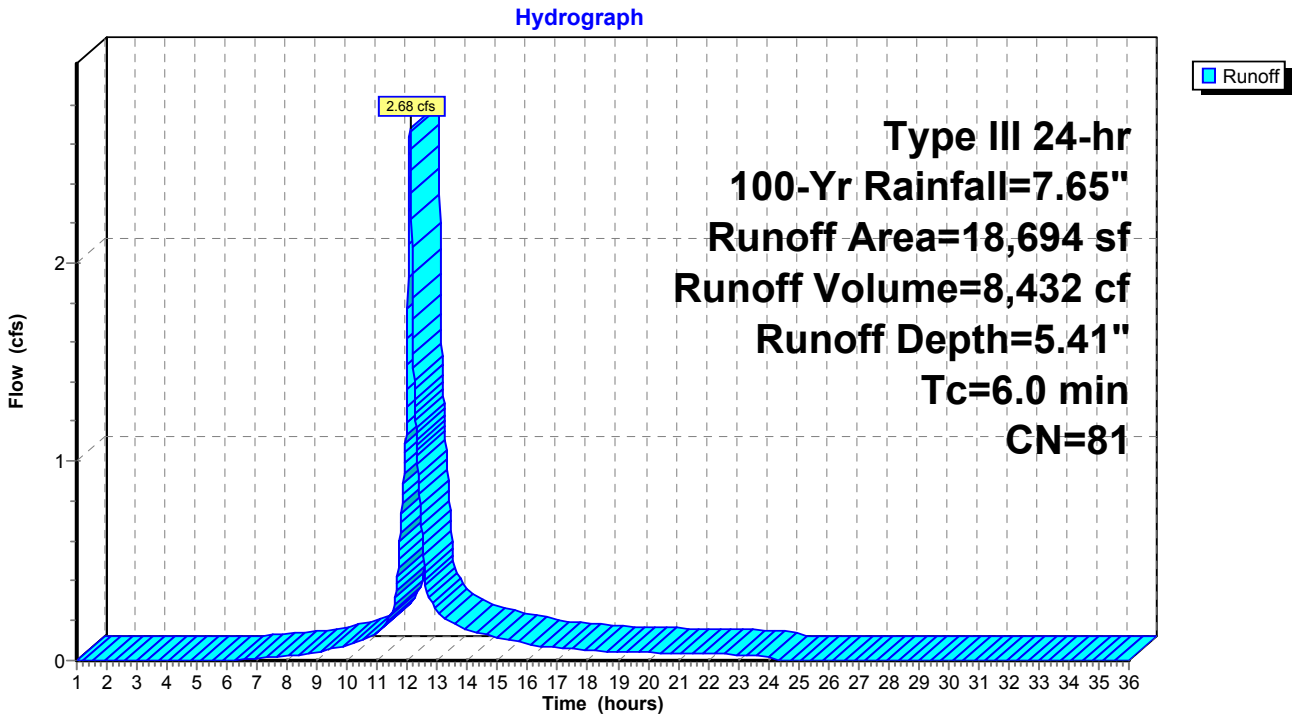
Runoff = 2.68 cfs @ 12.09 hrs, Volume= 8,432 cf, Depth= 5.41"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.65"

	Area (sf)	CN	Description
	12,754	74	>75% Grass cover, Good, HSG C
*	4,238	98	Impervious, HSG C
*	1,702	89	Gravel, HSG C
	18,694	81	Weighted Average
	14,456		77.33% Pervious Area
	4,238		22.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

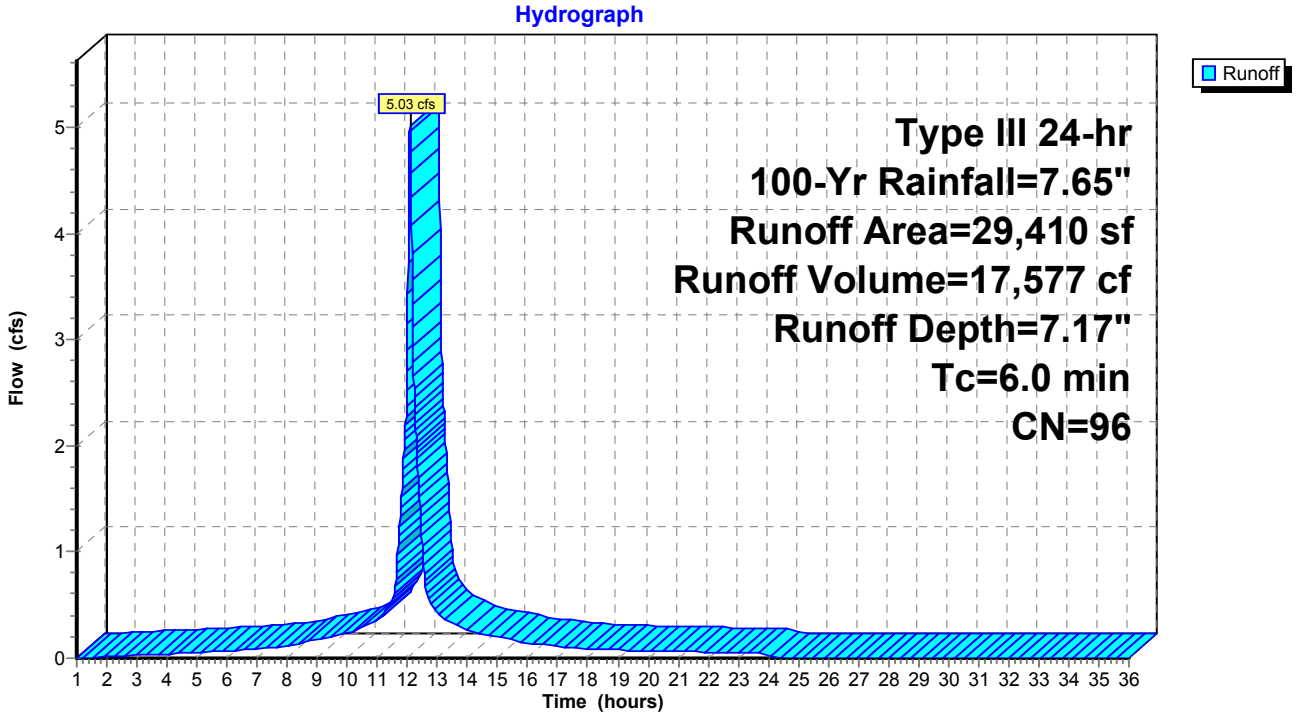
Runoff = 5.03 cfs @ 12.08 hrs, Volume= 17,577 cf, Depth= 7.17"
Routed to Pond IS-1 : IS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.65"

	Area (sf)	CN	Description
*	27,017	98	Impervious, HSG C
	2,393	74	>75% Grass cover, Good, HSG C
	29,410	96	Weighted Average
	2,393		8.14% Pervious Area
	27,017		91.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment A2: SUB-A2



Summary for Subcatchment B1: SUB-B1

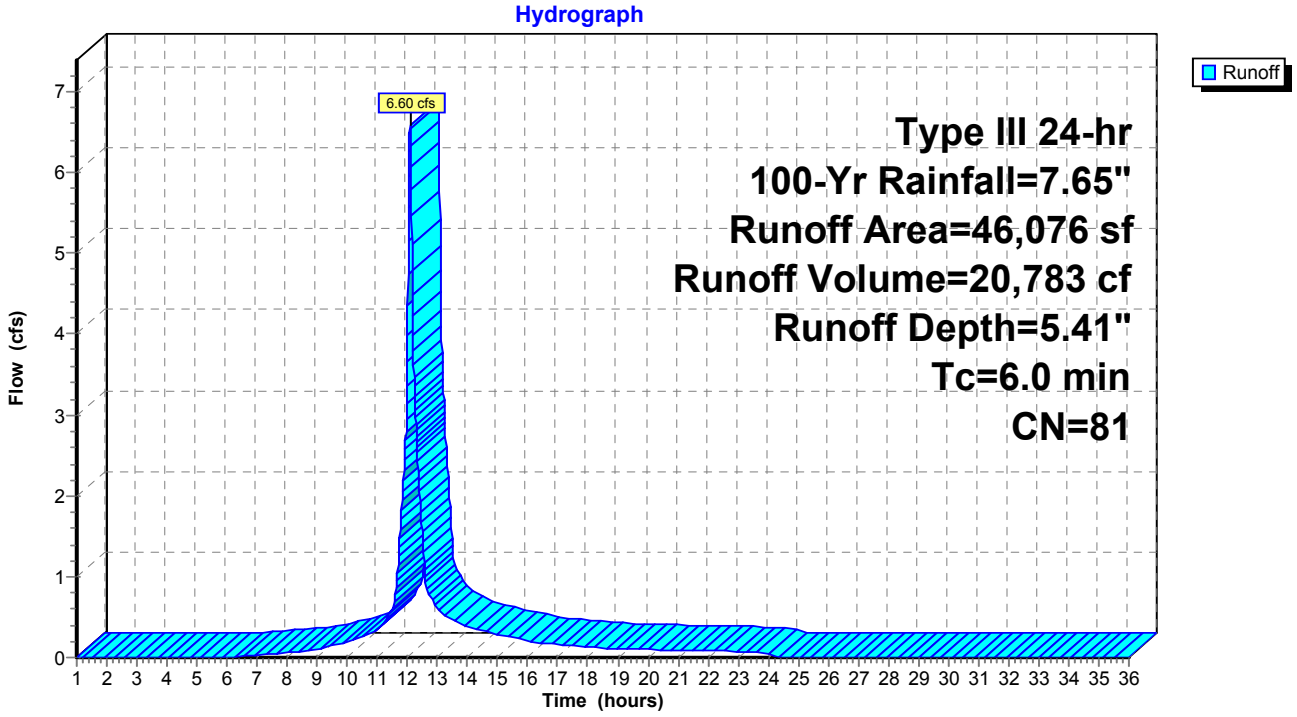
Runoff = 6.60 cfs @ 12.09 hrs, Volume= 20,783 cf, Depth= 5.41"
Routed to Pond B : POI-B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.65"

	Area (sf)	CN	Description
	31,699	74	>75% Grass cover, Good, HSG C
*	9,352	98	Impervious, HSG C
*	4,913	91	Sand, HSG C
*	85	89	Gravel, HSG C
	27	70	Woods, Good, HSG C
	46,076	81	Weighted Average
	36,724		79.70% Pervious Area
	9,352		20.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment B1: SUB-B1

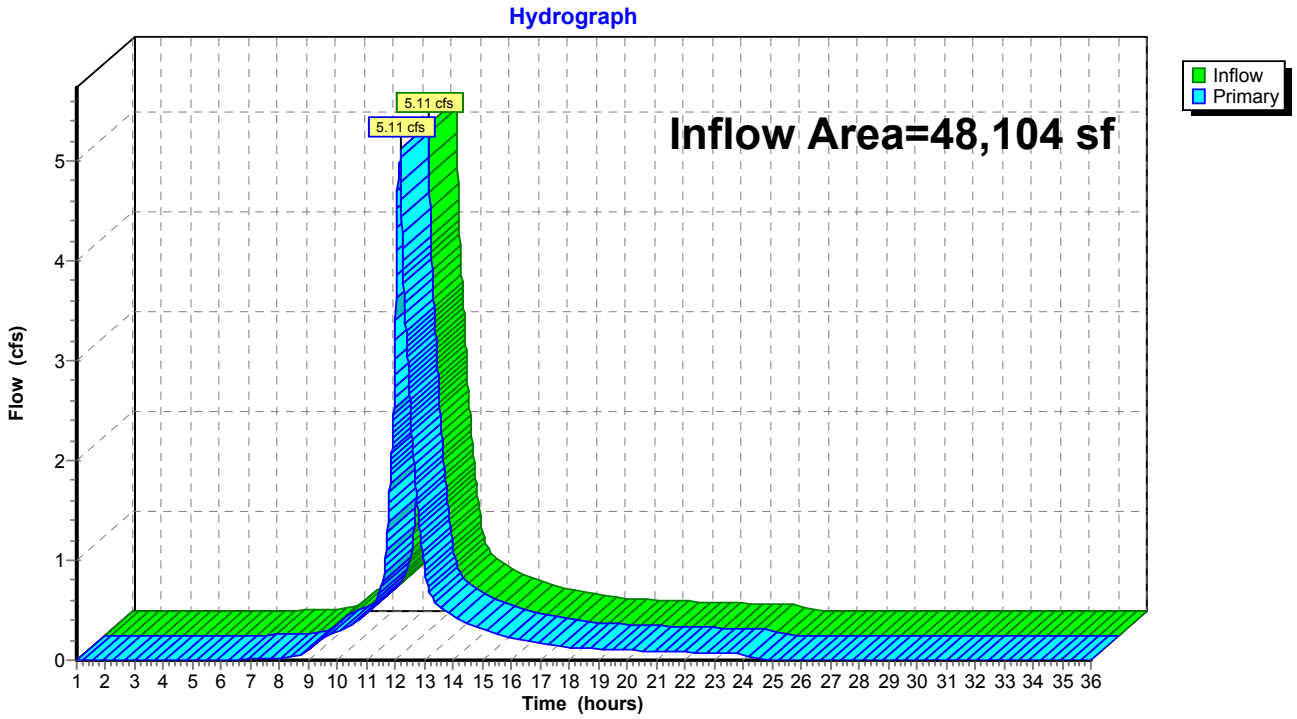


Summary for Pond A: POI-A

Inflow Area = 48,104 sf, 64.97% Impervious, Inflow Depth = 5.92" for 100-Yr event
Inflow = 5.11 cfs @ 12.16 hrs, Volume= 23,727 cf
Primary = 5.11 cfs @ 12.16 hrs, Volume= 23,727 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond A: POI-A

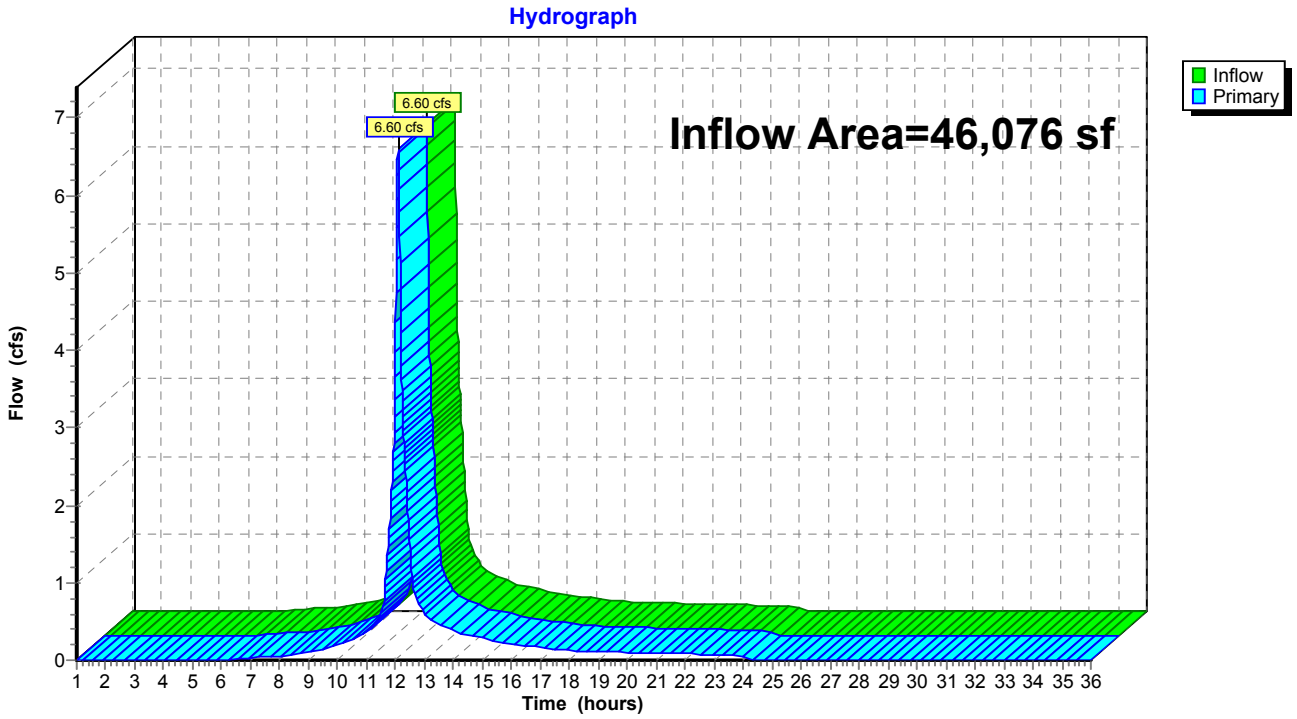


Summary for Pond B: POI-B

Inflow Area = 46,076 sf, 20.30% Impervious, Inflow Depth = 5.41" for 100-Yr event
Inflow = 6.60 cfs @ 12.09 hrs, Volume= 20,783 cf
Primary = 6.60 cfs @ 12.09 hrs, Volume= 20,783 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond B: POI-B



Summary for Pond IS-1: IS-1

Inflow Area = 29,410 sf, 91.86% Impervious, Inflow Depth = 7.17" for 100-Yr event
Inflow = 5.03 cfs @ 12.08 hrs, Volume= 17,577 cf
Outflow = 3.28 cfs @ 12.17 hrs, Volume= 16,736 cf, Atten= 35%, Lag= 5.4 min
Discarded = 0.01 cfs @ 2.95 hrs, Volume= 1,441 cf
Primary = 3.26 cfs @ 12.17 hrs, Volume= 15,295 cf
Routed to Pond A : POI-A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 670.86' @ 12.17 hrs Surf.Area= 1,858 sf Storage= 3,846 cf

Plug-Flow detention time= 101.1 min calculated for 16,736 cf (95% of inflow)
Center-of-Mass det. time= 73.1 min (826.3 - 753.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	667.50'	1,700 cf	**34.75'W x 53.46'L x 3.50'H Field A** 6,502 cf Overall - 2,251 cf Embedded = 4,251 cf x 40.0% Voids
#2A	668.00'	2,251 cf	**ADS_StormTech SC-740 +Cap** x 49 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 49 Chambers in 7 Rows
		3,951 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	667.50'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	668.00'	**12.0" Round Culvert** L= 74.9' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 668.00' / 667.63' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	668.60'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#4	Device 2	670.75'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.01 cfs @ 2.95 hrs HW=667.54' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=3.25 cfs @ 12.17 hrs HW=670.86' TW=0.00' (Dynamic Tailwater)
└**2=Culvert** (Passes 3.25 cfs of 4.56 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 2.68 cfs @ 6.82 fps)
  └**4=Sharp-Crested Rectangular Weir** (Weir Controls 0.57 cfs @ 1.07 fps)

Pond IS-1: IS-1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

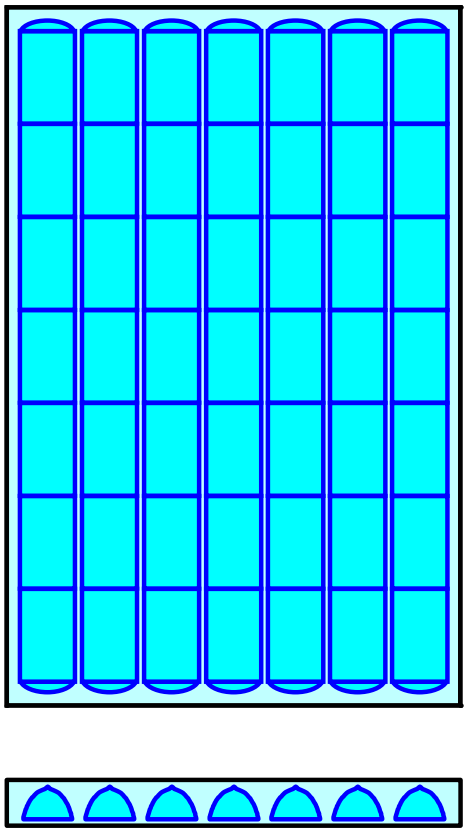
7 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 51.46' Row Length +12.0" End Stone x 2 = 53.46' Base Length
7 Rows x 51.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 34.75' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

49 Chambers x 45.9 cf = 2,251.1 cf Chamber Storage

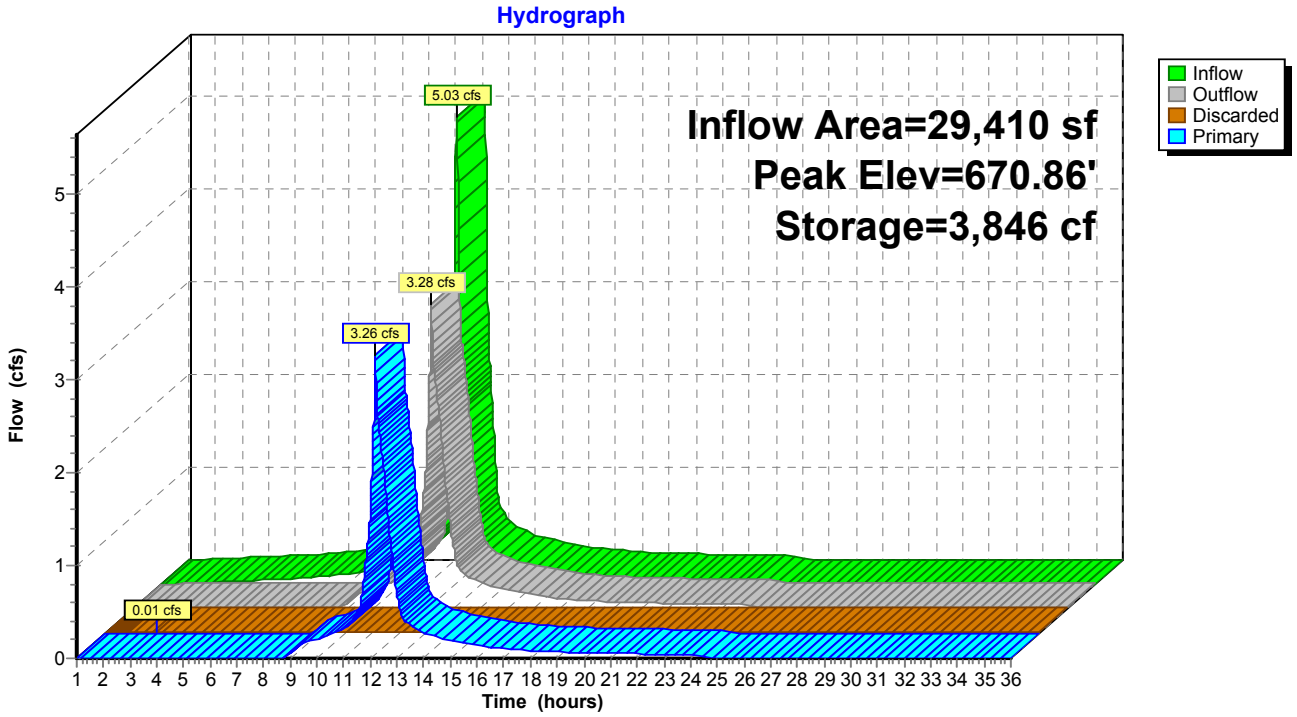
6,501.7 cf Field - 2,251.1 cf Chambers = 4,250.6 cf Stone x 40.0% Voids = 1,700.2 cf Stone Storage

Chamber Storage + Stone Storage = 3,951.3 cf = 0.091 af
Overall Storage Efficiency = 60.8%
Overall System Size = 53.46' x 34.75' x 3.50'

49 Chambers
240.8 cy Field
157.4 cy Stone



Pond IS-1: IS-1


Hydrograph
Inflow Area=29,410 sf
Peak Elev=670.86'
Storage=3,846 cf
5.03 cfs
3.28 cfs
3.26 cfs
0.01 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)
0 1 2 3 4 5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

Attachment E - Calculations

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Parking Lot Subsurface Chamber System

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Subsurface Infiltration Structure	**0.80**	**1.00**	**0.80**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**

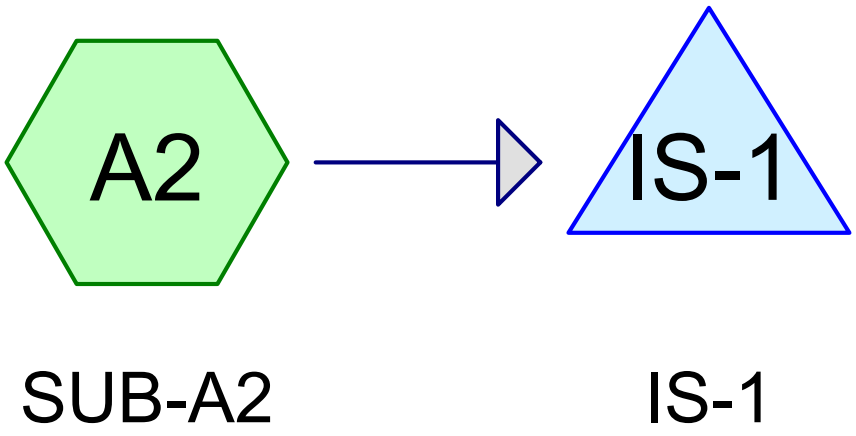
Total TSS Removal = **80%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Bell Pond Improvements**
Prepared By: **Aaron Guazzaloca**
Date: **3/22/2023**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1



Subcat Reach Pond Link

Routing Diagram for PR-HydroCAD - Isolator Row Sizing
Prepared by Weston & Sampson Engineers, Inc, Printed 3/16/2023

Summary for Subcatchment A2: SUB-A2

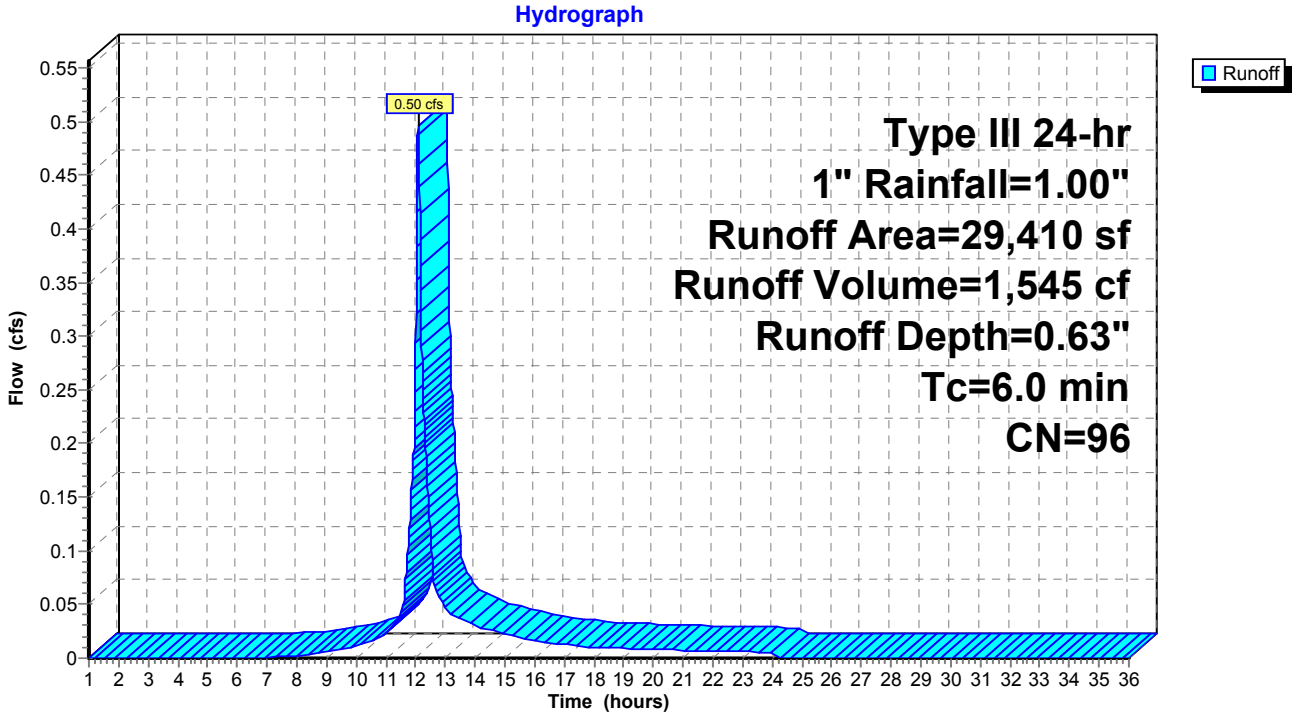
Runoff = 0.50 cfs @ 12.09 hrs, Volume= 1,545 cf, Depth= 0.63"
Routed to Pond IS-1 : IS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 1" Rainfall=1.00"

	Area (sf)	CN	Description
*	27,017	98	Impervious, HSG C
	2,393	74	>75% Grass cover, Good, HSG C
	29,410	96	Weighted Average
	2,393		8.14% Pervious Area
	27,017		91.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment A2: SUB-A2



Summary for Pond IS-1: IS-1

Inflow Area = 29,410 sf, 91.86% Impervious, Inflow Depth = 0.63" for 1" event
Inflow = 0.50 cfs @ 12.09 hrs, Volume= 1,545 cf
Outflow = 0.50 cfs @ 12.09 hrs, Volume= 1,545 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.50 cfs @ 12.09 hrs, Volume= 1,545 cf
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to nonexistent node A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 668.00' @ 12.09 hrs Surf.Area= 185 sf Storage= 1 cf

Plug-Flow detention time= 0.0 min calculated for 1,544 cf (100% of inflow)
Center-of-Mass det. time= 0.0 min (814.2 - 814.1)

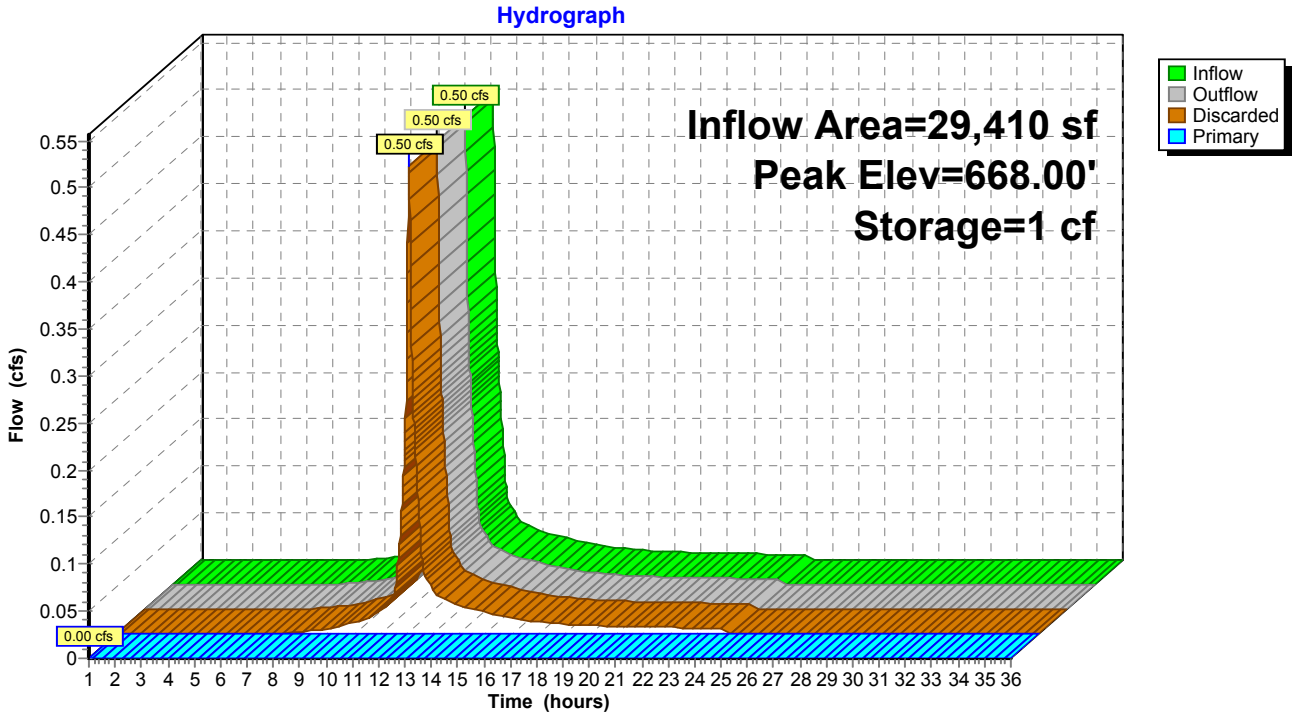
Volume	Invert	Avail.Storage	Storage Description
#1	668.00'	322 cf	**ADS_StormTech SC-740 +Cap** x 7 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

Device	Routing	Invert	Outlet Devices
#1	Discarded	668.00'	**1.40 cfs Exfiltration at all elevations** Phase-In= 0.01'
#2	Primary	669.04'	**12.0" Round Culvert** L= 14.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 669.04' / 669.04' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.50 cfs @ 12.09 hrs HW=668.00' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.50 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=668.00' (Free Discharge)
↑**2=Culvert** (Controls 0.00 cfs)

Pond IS-1: IS-1


Hydrograph
Inflow Area=29,410 sf
Peak Elev=668.00'
Storage=1 cf
Inflow
Outflow
Discarded
Primary
0.50 cfs
0.50 cfs
0.50 cfs
0.00 cfs
Flow (cfs)
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Time (hours)

STATE OF MAINE
DEPARTMENT OF
ENVIRONMENTAL PROTECTION

PAUL R. LEPAGE
GOVERNOR

PAUL MERCER
COMMISSIONER

July 29, 2016

StormTech, A Division of ADS, Inc.
70 Inwood Road, Suite 3
Rocky Hill, CT 06067
ATTN: David Mailhot P.E.

Dear Mr. Mailhot,

This letter replaces the letter dated March 22, 2016. It includes a slight modification in section 1 to clarify sizing requirements.

The Stormtech Isolator Row was approved by the Department of Environmental Protection (Department) in September 2009 for use as a pre-treatment row before a subsurface underdrained filter system as described in Chapter 7.3 of Volume III of the Maine Stormwater Management Best Management Practice Manual. The sizing, installation, and maintenance criteria provided in this letter replace the ones given in Chapter 7.3 of Volume III of the Maine Stormwater Management BMP Manual. The Department still authorizes the use of the StormTech Isolator Row as a pre-treatment row meeting the requirements of the General Standards (Section 4.C.) of the Stormwater Management Rules (Chapter 500) provided the system is sized, installed, and maintained in accordance with the following provisions:

1. The number of chambers within the Isolator Row pre-treatment structure must treat, without overflowing, the one-year 24-hour peak flow from the structure's drainage area. To determine the number of chambers, the one-year peak flow rate must be divided by the specific flow rate of the chamber. The acceptable flow rate for each of the Isolator Row chamber sizes are as follow:

Chamber size	Flow Rate
SC-310	0.1 cfs
SC-740 or DC-780	0.2 cfs
MC-3500	0.3 cfs

   Additional pre-treatment rows may be added based on site conditions and chamber bed layout provided each row is provided with access manhole and control structures.
2. The Isolator Row must be part of a stormwater management system that conforms to all the requirements of Chapter 7.3 of the Stormwater Management Manual and be fitted with an overflow that bypasses the pretreatment Isolator Row only when the one-year 24-hour peak flow is exceeded, and discharges to a stable outlet or is directed to a detention system/structure that will provide necessary flood storage.
3. The Isolator Row shall be underlain with a bottom surface consisting of two layers of ADS 315 woven geotextile or equivalent; and be covered with one layer of ADS 601T non-woven geotextile or equivalent.
4. The Isolator Row does not provide for the removal of hydrocarbons and should be preceded by a device or practice that will serve this function if the area draining to the Isolator Row is

AUGUSTA
17 STATE HOUSE STATION
AUGUSTA, MAINE 04333-0017
(207) 287-7688 FAX: (207) 287-7826

BANGOR
106 HOGAN ROAD, SUITE 6
BANGOR, MAINE 04401
(207) 941-4570 FAX: (207) 941-4584

PORTLAND
312 CANCO ROAD
PORTLAND, MAINE 04103
(207) 822-6300 FAX: (207) 822-6303

PRESQUE ISLE
1235 CENTRAL DRIVE, SKYWAY PARK
PRESQUE ISLE, MAINE 04769
(207) 764-0477 FAX: (207) 760-3143

web site: www.maine.gov/dep

a likely source of hydrocarbons (i.e. parking lots, roads, drive-through commercial enterprises).
5. The Isolator Row must include an access at both ends for the removal of accumulated sediment and debris.
6. The first year of system maintenance must be provided by the manufacturer to ensure that the system is operating according to the established specifications.
7. Prior to construction, a five-year binding inspection and maintenance contract must be provided for review and approval by the Department, and must be renewed before contract expiration. The contract will be with a professional with knowledge of erosion and stormwater control, including a detailed working knowledge of the proposed system.
8. The overall stormwater management design must meet all Department criteria and sizing specifications and will be reviewed and approved by the Department prior to use.
9. Each project must be reviewed and approved by the manufacturer for proposed use, layout and sizing of the pre-treatment row and for conformance with their design specifications.
10. The pre-treatment row must be installed under the manufacturer's representative supervision.
11. This approval is conditional to on-the-ground experience confirming that the StormTech Isolator Row system's pollutant removal efficiency is appropriate. The "permit shield" provision (Section 14) of the Chapter 500 rules will apply, and the Department will not require the replacement of the system if, with proper maintenance, pollutant removals do not satisfy the General Standard Best Management Practices.

We look forward to working with you as these stormwater management structures are installed on new projects. Questions concerning this decision should be directed to Marianne Hubert at (207) 215-6485 or Jeff Dennis at (207) 215-6376.

Sincerely,

Mark R Bergeron

Mark Bergeron, P.E.
Director
Bureau of Land Resources

Cc: Don Witherill, Maine DEP
Gregg Novick, Stormwater Compliance LLC
John Whitehouse, Advanced Drainage Systems, Inc.

NJCAT TECHNOLOGY VERIFICATION

Isolator® Row PLUS

StormTech, LLC

July 2020

Table of Contents

List of Figures

List of Tables

1. Description of Technology

The Isolator® Row PLUS (**shown in Figures 1 and 2**) is the first row of StormTech chambers that is surrounded with filter fabric and connected to a closely located manhole for easy access. The Isolator Row PLUS provides for settling and filtration of sediment as stormwater rises in the chamber and ultimately passes through the filter fabric. The open-bottom chambers allow stormwater to flow out of the chambers, while sediment is captured in the Isolator Row PLUS.

A single layer of proprietary Advanced Drainage Systems (ADS) PLUS fabric is placed between the angular base stone and the Isolator Row PLUS chamber. The geotextile provides the means for stormwater filtration and provides a durable surface for maintenance operations. A non-woven fabric is placed over the chambers. See link to O&M Manual (pg. 23) for installation pictures.

The Isolator Row PLUS is designed to capture the "first flush" runoff and offers the versatility to be sized on a volume basis or a flow basis. An upstream manhole not only provides access to the Isolator Row PLUS but includes a high/low concept such that stormwater flow rates or volumes that exceed the capacity of the Isolator Row PLUS bypass through a manifold to the other chambers. This is achieved with either an elevated bypass manifold or a high-flow weir. This creates a differential between the Isolator Row PLUS row of chambers and the manifold to the rest of the system, thus allowing for settlement time in the Isolator Row PLUS. After Stormwater flows through the Isolator Row PLUS and into the rest of the StormTech chamber system it is either infiltrated into the soils below or passed at a controlled rate through an outlet manifold and outlet control structure. **Since this technology fits under the infiltration basin BMP in the New Jersey Stormwater BMP Manual, it is not eligible for NJDEP MTD certification.**

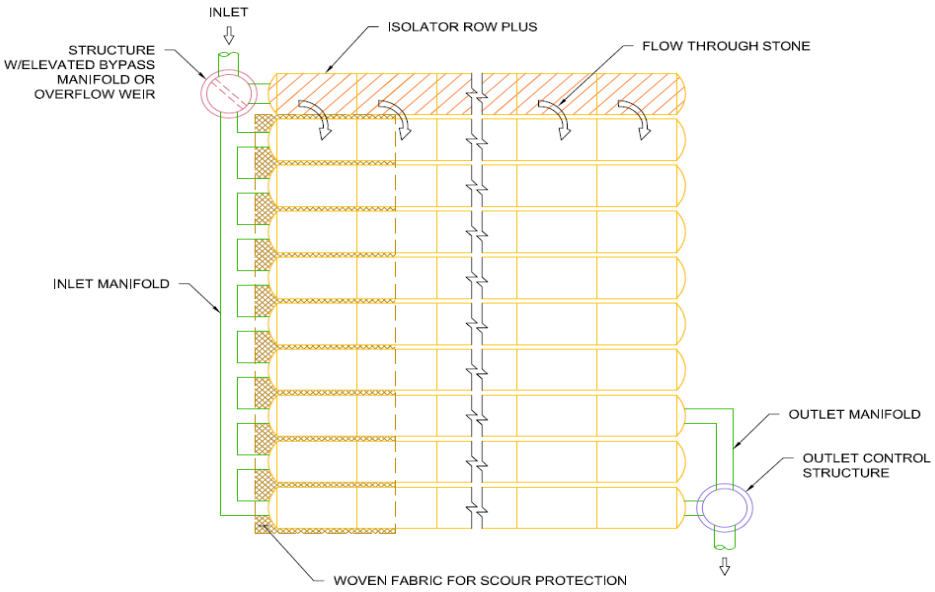


Figure 1 Schematic of the StormTech Isolator Row PLUS System

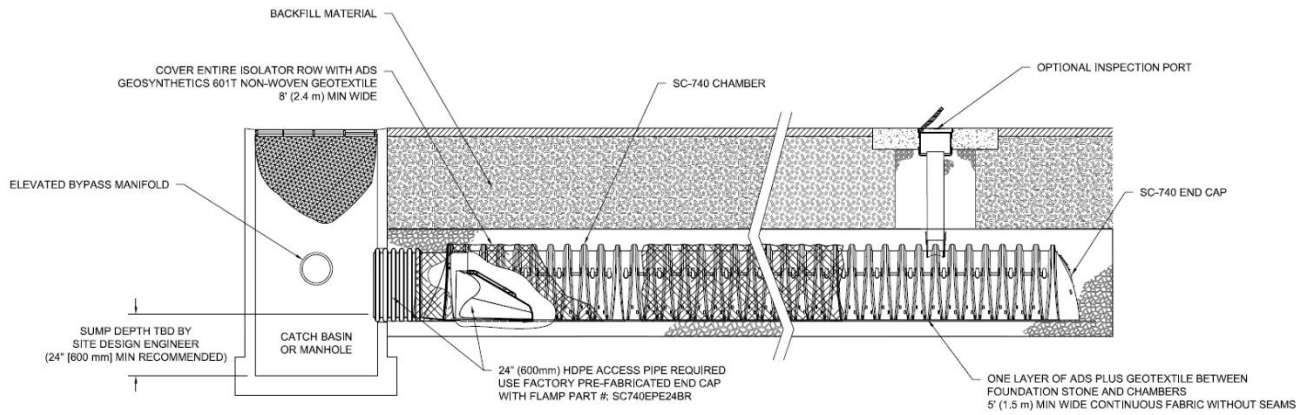


Figure 2 Isolator Row PLUS Detail

2. Laboratory Testing

Beginning in January 2020, two overlapping StormTech SC-740 Isolator Row PLUS commercial size chambers were installed at the BaySaver Laboratory in Mount Airy, Maryland, to evaluate the performance of Isolator Row PLUS on Total Suspended Solid (TSS) removal. Boggs Environmental Consultants (BEC) provided third-party review and oversight of all testing and data collection procedures, in accordance with the *New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device (January 2013)*. All sediment concentration samples were analyzed by Fredericktowne Labs (FTL) using ASTM D3977-97 (2019). All sediment PSD analysis was performed by Environmental Consulting Services (ECS), using the methodology of ASTM D422-63 (2007). Prior to the start of testing, a Quality Assurance Project Plan (QAPP), revision dated January 9, 2020, was submitted to, and approved by the New Jersey Corporation for Advanced Technology (NJCAT).

2.1 Test Setup

The testing system, shown in **Figure 3**, consisted of a source tank, feed pump, flow control valve, flow meter, background sample port, screw-auger sediment feeder (doser), and an Isolator Row PLUS test system. This verification report only addresses the performance of the Isolator Row PLUS and not the entire StormTech system, since this is the row designed to remove sediment until the system goes into bypass.

Testing Procedure

The water source was potable water from the Town of Mount Airy Water & Sewer Department, obtained from an onsite tap, which served as the raw water supply for the testing system. Municipal tap water was used to fill the source tank, and then pumped to the system. Flow rate was controlled to the target of 225 gpm by a flow control valve. An inline flow meter (FloCat MFE electromagnetic flow meter) was used to measure the flow, and a SeaMetrics DL76 data logger (pictured in **Figure 4**) recorded the flow at one-minute intervals. The test sediment was

introduced to the inlet stream via a 12 -inch dosing port teed with a 12-inch influent line (pictured in **Figure 5**) located approximately 4 feet upstream of the system inlet. The dosing rate was controlled by a screw-auger Velodyne Barracuda 1000A volumetric feeder with a ½ HP variable speed motor. The dosing rate was set to deliver an amount of sediment that, when mixed with the water from the source tank, would produce influent water with a target test sediment concentration of 200 mg/L.

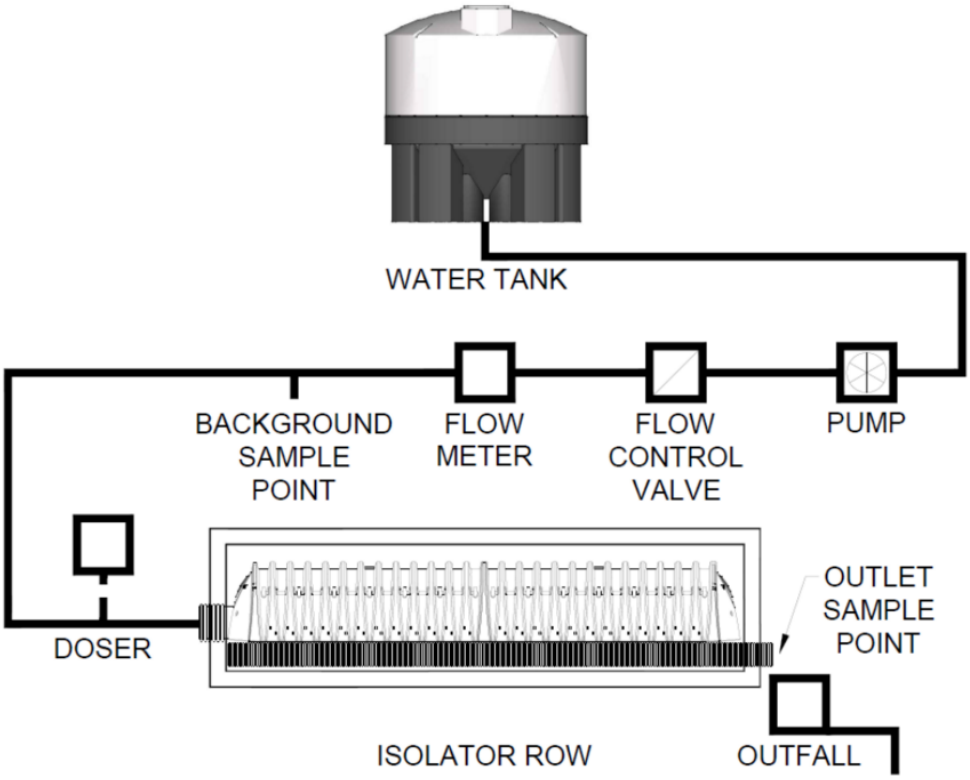


Figure 3 Schematic of the Isolator Row PLUS Test Configuration

The Isolator Row PLUS was installed inside a watertight 16'L x 6'W x 4'H test box (pictured in **Figures 6 and 7**). The Isolator Row PLUS is an arch-shaped stormwater detention/retention sediment collection and filtering device, sealed with end caps, with a 12"-inch inlet pipe welded into the upstream end cap. A ramp apparatus (patent pending) was attached to the inside of the chamber end cap to provide a smooth transition from pipe invert to fabric bottom. It is configured to improve chamber function performance over time by distributing sediment and debris that would otherwise collect at the inlet. It also serves to improve the fluid and solid flow back into the inlet pipe during maintenance and cleaning, and to guide cleaning and inspection equipment back into the inlet pipe when complete.

The chambers were installed on a 10-inch base of washed, angular, crushed stone, (#57, ¾ inch blue stone) containing an 8-inch perforated underdrain pipe running the length of the test box, penetrating the wall of the downstream end of the test box to the discharge collection point. An ADS non-woven geotextile fabric was placed over the top of the chamber row. The chambers were then backfilled with the washed crushed stone up to the top of the chamber elevation.

Additionally, an opening was cut into the top of one chamber to allow for visual monitoring and head measurement. No bypass or weir was installed upstream of the test box.

The test flow entered the chamber via the influent pipe and flowed across the filter fabric, filling the row. The water then flowed through the filter fabric, driven by hydrostatic head. The treated water exited the test box via the underdrain.

Figures 4 and 5 Photographs of Flow Meter and Sediment Delivery Port

Figure 6 Side View Photograph of Isolator Row PLUS Test Box

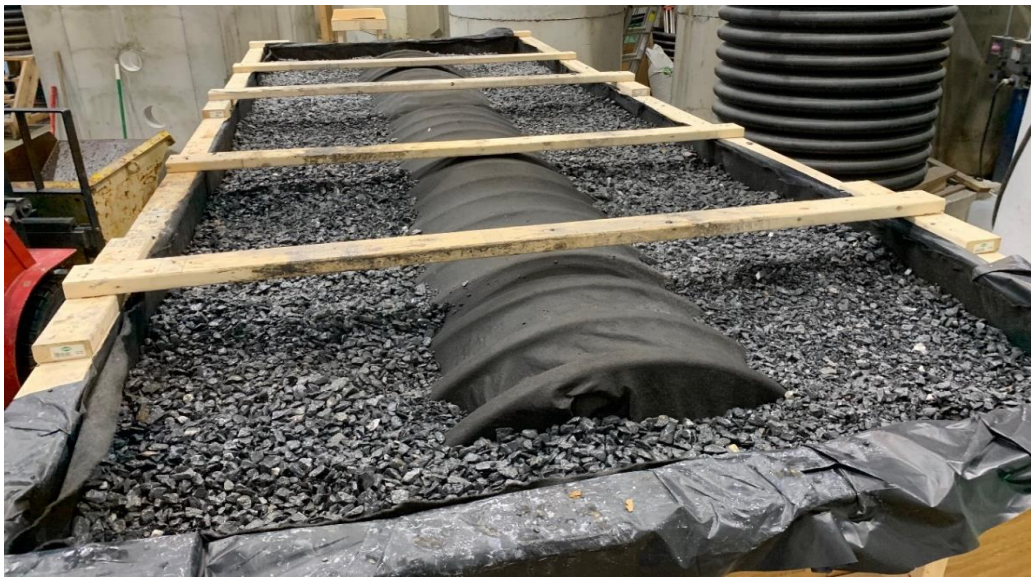


Figure 7 Top View Photograph of Isolator Row PLUS Test Box

Test Unit and Scaling Explanation

The Isolator Row PLUS used in this test was constructed from two (2) overlapping polypropylene open-bottom StormTech SC-740 chambers (one shortened by 5-in. to enable fitting into the test box), two (2) SC-740 end caps, a ramp apparatus and one layer of ADS PLUS geotextile fabric. The chamber floor filtration area (effective filtration treatment area, EFTA) was approximately 54.5 ft^2. (calculated using an average contact width inside the chamber of 45 in). The target test flow was 225 gpm. The calculated hydraulic loading rate, flow rate/EFTA is 4.13 gpm/ft^2 and the ratio of effective sedimentation treatment area to EFTA is 1.0. Given these data, one can effectively scale the test results for all commercial systems.

Sample Collection

The grab sampling method was used for all sample collection by sweeping a wide-mouth 1-L plastic bottle through the free-discharge effluent stream, to ensure the full cross section of the flow was sampled. The start time for each run was recorded.

The sampling schedule is provided in **Table 1**. The detention time for the Isolator Row PLUS unit operating at 20 inches hydrostatic head (maximum head tested) is 2.1 minutes. To comply with the NJDEP Filter Protocol, after initiating and stabilizing the flow rate at the MTFR and beginning sediment feed, effluent sampling did not begin until the filtration MTD has been in operation for a minimum of three detention times.

Background water samples were collected upstream of the doser (shown in **Figures 3 and 8**) in correspondence with the odd-numbered effluent samples (i.e., Samples E1, E3, E5 at t = 9, 20, 31 minutes).

Table 1 Sampling Schedule for the Isolator Row PLUS Tests

Time (min)	Sample(s)	Time (min)	Sample(s)
0	S1	22	S3
9	E1, BG1	31	E5, BG3
10	E2	32	E6
11	S2	33	Stop Flow
20	E3, BG2	N/A	DDA
21	E4	N/A	DDB

NOTE: S = sediment rate; E = effluent; BG = background; DD = drawdown

Figure 8 Photograph of Background Sampling Port

Two evenly-volume-spaced drawdown samples, DDA and DDB, were taken after the flow and sediment feed to the unit had been stopped.

Sediment injection rates were measured using a stopwatch and the mass collected measured on a calibrated scale once at the very beginning of the run and twice more during the run. A fourth sediment rate sample was taken after the run was finished as an internal check but was not included in the calculations for the report. The duration of each run was 33 minutes.

A Chain of Custody (COC) form was used for each test run to record sampling date and time for externally analyzed samples. Copies of these forms were maintained by BaySaver Laboratory and FTL. Sample bottles were labeled to identify the test run number and sample type (e.g., background, effluent), corresponding to the sample identification on the COC form. BEC was present during each test run and witnessed labeling, completion of COC forms, and packaging of

samples for delivery to the external laboratory (FTL). Each person taking or relinquishing possession of the samples was required to sign a COC form before samples changed hands.

Other Instrumentation and Measurement

Water temperature was recorded every minute by a HOBO data logger placed in the source water tank of the test system. The water level in the Isolator Row PLUS was recorded every 5 minutes by visual observation of a yardstick mounted through the observation port on top of the first chamber. Run and sampling times were measured using a digital timer and a stopwatch, respectively.

2.2 Test Sediment

The test sediment had the particle size distribution (PSD) presented in **Figure 9**. The test sediment was custom-blended using various commercially available silica sands. The resulting blended sediment met the specification for the NJDEP Filter Protocol. The test sediment was batched, labeled, and stored in covered bins for the duration of this project. Under the supervision of BEC, twenty-one subsamples, taken from various locations within the test sediment containers, were composited. From the composite, three random samples were taken for PSD and moisture content analyses, which were performed by ECS, using the methodology of ASTM method D422-63 (2007).

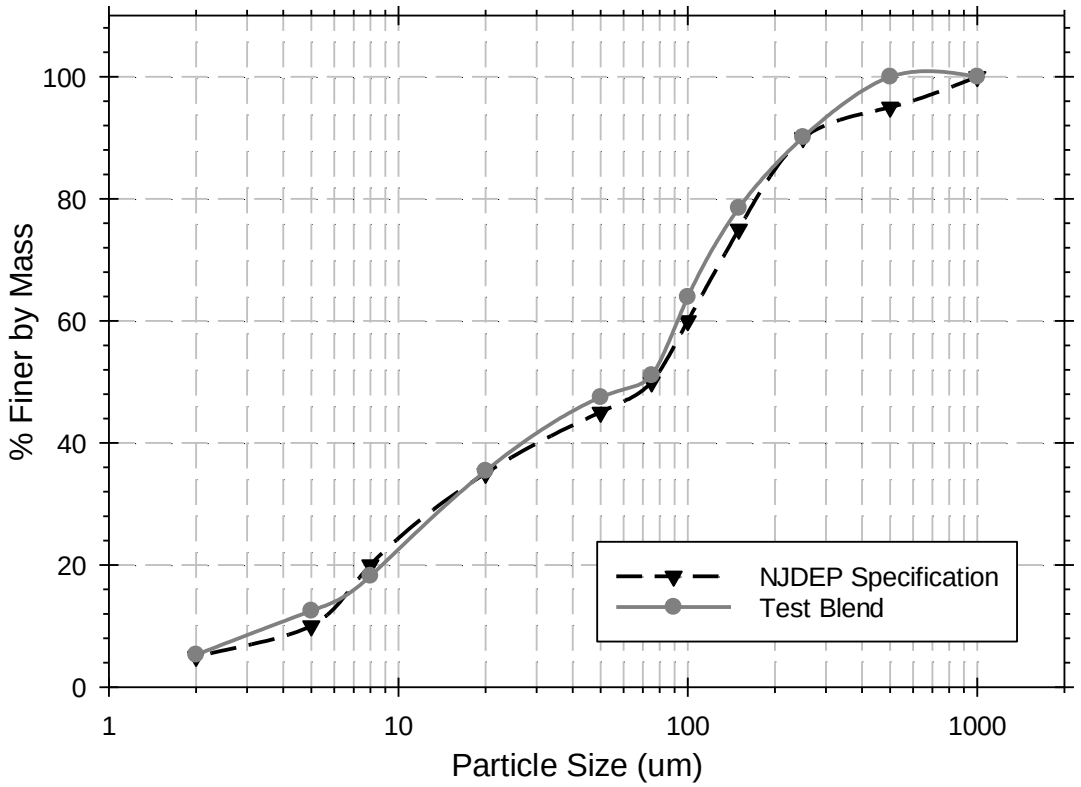


Figure 9 Average Particle Size Distribution of Test Sediment Verified by ECS

The PSD test analysis results are summarized in **Table 2**. ECS results showed that 17-19% of the particles were less than 8 µm and 89-90% of the particles were less than 250 µm. The d_{50} values (approximately 72 µm) also indicated that there was no significant difference between the NJDEP target gradation and the ECS-verified gradation of the test sediment. Thus, the blended test sediment was found to meet the NJDEP particle size specification and was acceptable for use. ECS also analyzed the sediment samples for moisture. The average moisture content was 0.1%.

Table 2 Particle Size Distribution of Test Sediment as Analyzed by ECS

Particle Size (µm)	Test Blend % Finer by Mass Analyzed by ECS				
	NJ Blend A	NJ Blend B	NJ Blend C	Average	NJDEP Specification (minimum % finer)
1000	100.0	100.0	100.0	100.0	98
500	100.0	100.0	100.0	100.0	93
250	90.3	89.8	90.2	90.1	88
150	79.3	78.1	78.1	78.5	73
100	66.0	63.2	62.7	63.9	58
75	52.0	50.9	50.3	51.1	50
50	47.5	47.7	47.4	47.5	43
20	35.9	36.0	34.3	35.4	33
8	18.6	18.7	17.4	18.2	18
5	13.0	13.0	11.6	12.5	8
2	5.5	5.4	5.1	5.3	3
d_{50}	69 µm	72 µm	74 µm	72 µm	75 µm

2.3 Sediment Removal Efficiency Testing

Sediment removal efficiency testing adhered to the guidelines set forth in Section 5 of the NJDEP Laboratory Protocol for Filtration MTDs. The target flow through the system was 225 gpm, with a target sediment concentration of 200 mg/L. All samples were collected in clean, 1-L wide-mouth bottles. Three background samples were taken at 9, 20 and 31 minutes after the test began to ensure the supply water met the sediment concentration requirement. According to the NJDEP Filter Protocol, these background concentrations cannot exceed a TSS concentration of 20 mg/L.

The test sediment screw-auger feeder introduced the test sediment into the influent stream to achieve the target influent TSS concentration of 200 mg/L. According to the NJDEP Filter Protocol, this influent concentration must stay within 10% of target, allowing for a 180 mg/L to 220 mg/L influent concentration. The feeder was calibrated prior to each run. In order to confirm sediment feed rates during the test, in accordance with the NJDEP Filter Protocol, three samples of the test sediment were collected from the injection point (**Figure 3**, "Doser") into a clean one-liter container for verification of sediment feed rate, over an interval timed to the nearest second, with a minimum volume of 0.1 liter or a collection interval not exceeding one minute (whichever came first). The time was measured with a stopwatch. The samples were weighed to the nearest

milligram in the BaySaver Laboratory under the observation of BEC. The sediment feed rate coefficient of variance (COV) for the test sediment samples did not exceed 0.10. The mass from the sediment feed rate measurement samples was subtracted from the total mass introduced to the system when removal efficiency was calculated.

Effluent sampling was performed by the grab sampling method during each run, according to the schedule in **Table 1**. When the test sediment feed was interrupted for test sediment measurements, the next effluent samples were collected after at least three detention times had elapsed. During the drawdown period, two evenly volume-spaced samples were collected after flow and sediment feed had stopped. All sediment concentration samples were analyzed by Fredericktowne Labs (FTL) using ASTM D3977-97 (2019) "Standard Test Methods for Determining Sediment Concentrations in Water Samples."

2.4 Sediment Mass Loading Capacity

The sediment mass loading capacity testing occurred as a continuation of removal efficiency testing, with the target for influent concentration remaining at 200 mg/L, and all aspects of testing procedures kept the same to ensure consistency throughout. The sediment mass loading capacity of the Isolator Row PLUS is defined per the protocol as the point at which the cumulative mass removal drops below 80.0%. For this testing program, the sediment mass loading testing was stopped prior to that point (after Run 16), because it was incorrectly assumed this criterion was reached. Thus, the mass loading is defined as mass loaded into the unit through the end of Run 16.

3. Supporting Documentation

The Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from NJCAT states that copies of the laboratory test reports, all data from performance evaluation test runs, original data, pertinent calculations, and documentation of any maintenance activities that occur during the testing process are to be included in this section. All of this information has been provided to NJCAT and is available upon request. It is not practical to include it in this report.

4. Testing Results

A total of 16 removal efficiency testing runs were completed in accordance with the NJDEP filter protocol. The target flow and influent sediment concentration were 225 gpm and 200 mg/L, respectively. The results from all 16 runs were used to calculate the overall cumulative removal efficiency of the Isolator Row PLUS.

4.1 Flow Rate

Flow was monitored by an inline flow meter (FloCat MFE electromagnetic flow meter) and recorded by a SeaMetrics DL76 data logger every minute during each run. For each run, the flow was maintained within 10% of the target (202.5 – 247.5 gpm). The average flow for all 16 runs was 226.1 gpm. The flow data with coefficient of variance (COV) values for all 16 runs are summarized in **Table 3**.

4.2 Water Temperature

Temperatures were recorded every minute by a HOBO water level logger (U20L-04). On average for all runs, the water temperature during testing was 45.7 degrees Fahrenheit, with a maximum of 52.2 degrees Fahrenheit, meeting the NJDEP Filter Protocol requirement to be below 80 degrees Fahrenheit. Data are summarized in **Table 3**.

Table 3 Flow Rate and Temperature Summary for All Runs

Run	Max Flow (gpm)	Min Flow (gpm)	Average Flow (gpm)	Flow COV	Flow Compliance (COV< 0.1)	Maximum Temperature (Fahrenheit)	NJDEP Temperature Compliance (< 80 F)
1	232.8	223.9	226.3	0.0078	Y	48.2	Y
2	228.9	218.6	220.8	0.0104	Y	51.5	Y
3	229.4	220.0	227.2	0.0094	Y	44.7	Y
4	230.2	218.7	223.2	0.0138	Y	40.5	Y
5	228.7	216.9	222.2	0.0103	Y	44.7	Y
6	227.6	217.0	224.2	0.0115	Y	46.7	Y
7	229.7	221.9	226.4	0.0092	Y	44.6	Y
8	230.3	222.2	226.8	0.0089	Y	43.5	Y
9	233.2	218.4	225.6	0.0136	Y	45.5	Y
10	232.2	219.7	228.4	0.0126	Y	44.7	Y
11	226.9	219.2	224.1	0.0088	Y	52.4	Y
12	232.2	222.1	226.9	0.0107	Y	48.5	Y
13	234.7	221.2	226.1	0.0109	Y	48.5	Y
14	231.9	223.4	228.7	0.0103	Y	45.6	Y
15	236.8	224.1	231.4	0.0131	Y	52.2	Y
16	232.5	221.3	229.0	0.0137	Y	47.8	Y
Average			226.1			45.7	
Max						52.2	

4.3 Head

The head level in the Isolator Row PLUS was recorded to the nearest 1/8 inch every five minutes, through visual observation of a yard stick mounted through the observation port of the first chamber. With each run, after the first several measurements, the head during the run remained the same or increased slightly over that of the previous run. The maximum head reached during all 16 runs was 18.75 inches. Maximum head for each run is summarized in **Table 4**.

Table 4 Maximum Head (inches) for All Runs

Run	Maximum Head (inches)	Run	Maximum Head (inches)
1	9.00	9	17.50
2	12.00	10	18.00
3	14.00	11	17.25
4	15.25	12	18.00
5	15.75	13	18.25
6	16.25	14	18.50
7	17.50	15	18.75
8	17.25	16	18.75

4.4 Sediment Concentration and Removal Efficiency

Background TSS

Municipal tap water was used as the water source during testing. The background TSS concentration for all runs was well below the 20 mg/L NJDEP Protocol limit. Background TSS concentrations for each run are provided in **Table 5**. The average background TSS concentration for each run was subtracted from the effluent and drawdown concentrations to provide adjusted figures, per the protocol.

Sediment Dosing Rate and Influent TSS

Influent TSS concentration was calculated by dividing the total mass of sediment added during a given run by the total volume of water flowing through the MTD during the addition of test sediment during that run. The volume of water flowing through the device during the run was calculated by multiplying the average measured flow by the time of sediment addition only. The average influent TSS was 204.2 mg/L, with individual run averages ranging from 195.9 to 216.7 mg/L. All values are within the target range of 200 ± 20 mg/L. **Tables 6 and 7** provide the measured sediment rates for each run, and the resulting calculated influent TSS concentration. In these tables, NJDEP Protocol compliance is defined as a TSS concentration in the range 180 – 220 mg/L and sediment feed rate COV < 0.1.

Table 5 Background TSS Concentrations

Run	BG TSS 9 min (mg/L)	BG TSS 20 min (mg/L)	BG TSS 31 min (mg/L)	Average (mg/L)	MDL (mg/L)
1	0.5	4	2	2.2	1.0
2	1	1	0.5	0.8	1.0
3	1	0.5	0.5	0.7	1.0
4	0.5	0.5	0.5	0.5	1.0
5	0.5	0.5	0.5	0.5	1.0
6	0.5	0.5	0.5	0.5	1.0
7	0.5	0.5	0.5	0.5	1.0
8	0.5	0.5	0.5	0.5	1.0
9	0.5	0.5	0.5	0.5	1.0
10	0.5	0.5	0.5	0.5	1.0
11	0.5	0.5	0.5	0.5	1.0
12	0.5	0.5	0.5	0.5	1.0
13	0.5	0.5	0.5	0.5	1.0
14	0.5	0.5	0.5	0.5	1.0
15	0.5	0.5	0.5	0.5	1.0
16	0.5	0.5	0.5	0.5	1.0

Note: In cases where the measured background TSS concentration was below the Minimum Detection Level (MDL) of 1.0 mg/L, half the MDL was reported for the background concentration.

Table 6 Sediment Rate Measurements for Runs 1-10

Run	Run Time (min)	Sediment Weight (g)	Duration (s)	Sediment Feed Rate (g/min)	Influent Water Flow Rate (gpm)	Influent TSS Conc. (mg/L)	NJDEP Compliance
1	0	117.767	39.78	177.6	226.3	202.9	Y
	11	110.674	40.16	165.4			
	22	118.819	40.00	178.2			
	COV			0.0418			
2	0	114.921	39.91	172.8	220.8	198.5	Y
	11	106.158	39.96	159.4			
	22	110.429	40.10	165.2			
	COV			0.0404			
3	0	117.364	39.85	176.7	227.2	206.8	Y
	11	116.700	39.90	175.5			
	22	120.156	39.72	181.5			
	COV			0.0179			
4	0	121.043	39.79	182.5	223.2	216.7	Y
	11	125.058	39.88	188.2			
	22	118.657	39.85	178.7			
	COV			0.0261			
5	0	111.624	40.03	167.3	222.2	215.0	Y
	11	117.883	40.00	176.8			
	22	132.393	39.88	199.2			
	COV			0.0904			
6	0	114.723	39.94	172.3	224.2	206.6	Y
	11	119.043	40.03	178.4			
	22	117.644	40.28	175.2			
	COV			0.0174			
7	0	115.351	40.00	173.0	226.4	198.1	Y
	11	110.196	40.25	164.3			
	22	114.603	40.00	171.9			
	COV			0.0281			
8	0	115.664	39.72	174.7	226.8	201.5	Y
	11	117.915	39.93	177.2			
	22	110.840	39.82	167.0			
	COV			0.0307			
9	0	116.845	39.87	175.8	225.6	205.2	Y
	11	114.135	39.81	172.0			
	22	117.894	39.75	178.0			
	COV			0.0172			
10	0	111.306	39.57	168.8	228.4	203.0	Y
	11	119.680	39.81	180.4			
	22	118.275	39.90	177.9			
	COV			0.0347			

Table 7 Sediment Rate Measurements for Runs 11-16

Run #	Run Time (min)	Sediment Weight (g)	Duration (s)	Sediment Feed Rate (g/min)	Influent Water Flow Rate (gpm)	Influent TSS Conc. (mg/L)	NJDEP Compliance
11	0	114.505	39.90	172.2	224.1	207.8	Y
	11	119.160	39.94	179.0			
	22	118.629	40.03	177.8			
	COV			0.0207			
12	0	115.516	39.78	174.2	226.9	208.8	Y
	11	118.805	39.87	178.8			
	22	124.236	40.22	185.3			
	COV			0.0311			
13	0	114.776	39.78	173.1	226.1	198.0	Y
	11	106.924	39.85	161.0			
	22	115.083	39.69	174.0			
	COV			0.0429			
14	0	112.871	39.72	170.5	228.7	199.9	Y
	11	116.869	39.84	176.0			
	22	114.529	39.81	172.6			
	COV			0.0161			
15	0	112.091	39.72	169.3	231.4	195.9	Y
	11	112.200	39.81	169.1			
	22	117.588	39.94	176.6			
	COV			0.0250			
16	0	118.503	39.59	179.6	229.0	202.3	Y
	11	116.834	39.78	176.2			
	22	112.971	39.84	170.1			
	COV			0.0273			

Effluent TSS

During each run, grab samples were taken of the effluent according to the schedule in **Table 1**, and all TSS analyses were conducted by Fredericktowne Labs. For each run, the average effluent concentration was adjusted by subtracting the average background TSS concentration. The average adjusted effluent TSS concentration during testing was 39 mg/L, with individual run averages ranging from 32.0 to 45.5 mg/L. Effluent and adjusted effluent TSS concentrations for each run are given in **Table 8**.

Table 8 Effluent Sample TSS Concentrations

Run	EFF TSS 9 min	EFF TSS 10 min	EFF TSS 20 min	EFF TSS 21 min	EFF TSS 31 min	EFF TSS 32 min	Mean	MDL	Adjusted Effluent TSS
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
1	48	48	47	47	48	48	47.7	1.0	45.5
2	32	32	33	32	35	33	32.8	1.0	32.0
3	33	37	37	40	38	38	37.2	1.0	36.5
4	28	31	34	38	32	38	33.5	1.0	33.0
5	40	41	39	33	42	42	39.5	1.0	39.0
6	38	41	39	37	41	44	40.0	1.0	39.5
7	37	40	37	36	37	38	37.5	1.0	37.0
8	38	41	38	40	32	38	37.8	1.0	37.3
9	35	41	36	36	42	41	38.5	1.0	38.0
10	39	44	34	38	37	41	38.8	1.0	38.3
11	35	41	38	38	38	43	38.8	1.0	38.3
12	36	43	36	41	46	47	41.5	1.0	41.0
13	41	46	37	37	42	45	41.3	1.0	40.8
14	44	49	39	42	42	45	43.5	1.0	43.0
15	40	43	41	39	40	45	41.3	1.0	40.8
16	43	45	41	44	45	46	44.0	1.0	43.5

Note: Adjusted effluent TSS concentration is the average effluent TSS concentration minus the average background TSS concentration (Table 5).

Drawdown TSS

According to the NJDEP Filter Protocol, the amount of sediment that leaves the filter during the drawdown period must be accounted for and documented. During each run, two evenly volume-spaced grab samples were taken of the drawdown, and all TSS analyses were conducted by Fredericktowne Labs. For each run, the average drawdown concentration was adjusted by subtracting the average background TSS concentration (**Table 9)**.

Table 9 Drawdown Sample TSS Concentrations

Run	DDA	DDB	Average	MDL	Adjusted Drawdown TSS
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
1	62	11	36.5	1.0	34.3
2	39	16	27.5	1.0	26.7
3	42	14	28.0	1.0	27.3
4	41	18	29.5	1.0	29.0
5	42	16	29.0	1.0	28.5
6	45	17	31.0	1.0	30.5
7	44	16	30.0	1.0	29.5
8	48	17	32.5	1.0	32.0
9	42	18	30.0	1.0	29.5
10	45	17	31.0	1.0	30.5
11	43	17	30.0	1.0	29.5
12	44	16	30.0	1.0	29.5
13	46	18	32.0	1.0	31.5
14	50	18	34.0	1.0	33.5
15	47	17	32.0	1.0	31.5
16	48	15	31.5	1.0	31.0

Note: Adjusted drawdown TSS concentration is the average drawdown TSS concentration minus the average background TSS concentration (Table 5).

In order to estimate the volume of water during drawdown, under observation by BEC, the unit was filled prior to all testing with clean water and the drawdown volume as a function of time was calculated from the height of the flow stream in the effluent pipe as a function of time. Total drawdown volume was estimated at 268.6 gal at an operating head of 2.5 inches. This volume was used to determine the volume of the void space of the gravel bed, which was then used, along with the dimensions of the Isolator Row PLUS chambers, to calculate the drawdown volume for incremental head levels above 2.5 inches. Adjusted average drawdown TSS concentrations and drawdown losses are given in **Table 10**.

Table 10 Drawdown Losses

Run	Head Level at End of Run (in)	Drawdown Volume (gal)	Average Adjusted Drawdown TSS Conc. (mg/L)	Total Sediment Lost During Drawdown (g)
1	9.00	285.2	34.3	37.1
2	12.00	354.2	26.7	35.7
3	14.00	403.3	27.3	41.7
4	15.25	432.8	29.0	47.5
5	15.75	443.9	28.5	47.9
6	16.25	454.2	30.5	52.4
7	17.50	476.0	29.5	53.2
8	17.00	468.2	32.0	56.7
9	17.25	472.3	29.5	52.7
10	17.75	476.0	30.5	55.0
11	17.25	472.3	29.5	52.7
12	17.5	476.0	29.5	53.2
13	18.00	482.4	31.5	57.5
14	18.25	484.9	33.5	61.5
15	18.50	486.8	31.5	58.1
16	18.25	484.9	31.0	56.9

Removal Efficiency Calculation

Removal efficiency was calculated using the following equation from the NJDEP Filter Protocol:

$$\text{Removal Efficiency (\%)} = \frac{\left(\begin{array}{c}\text{Average Influent}\\ \text{TSS Concentration x}\\ \text{Total Volume}\\ \text{of Test Water}\end{array}\right) - \left(\begin{array}{c}\text{Adjusted Effluent}\\ \text{TSS Concentration x}\\ \text{Total Volume}\\ \text{of Effluent Water}\end{array}\right) - \left(\begin{array}{c}\text{Average}\\ \text{Drawdown Flow}\\ \text{TSS Concentration x}\\ \text{Total Volume}\\ \text{of Drawdown Water}\end{array}\right)}{\text{Average Influent TSS Concentration x Total Volume of Test Water}} \text{ x } 100$$

For each run, sediment concentrations of background, influent, effluent, and drawdown, as well as the calculated removal efficiency, are summarized in **Table 11**. As shown in this summary table, the Isolator Row PLUS demonstrated a cumulative sediment removal efficiency of 81.2% over the course of 16 test runs.

Table 11 Removal Efficiency Results

Run	Average Influent TSS (mg/L)	Influent Water Volume (gal)	Adjusted Average Effluent TSS (mg/L)	Effluent Water Volume (gal)	Adjusted Average Drain Down TSS (mg/L)	Drain Down Water Volume (gal)	Single Run Removal Efficiency (%)	Mass of Captured Sediment (g)	Cumulative Removal Efficiency (%)
1	203	7166	46	6881	34	285	77.8	4282	77.8
2	199	6993	32	6639	27	354	84.0	4415	80.8
3	207	7197	37	6793	27	403	82.6	4654	81.4
4	217	7068	33	6635	29	433	84.9	4923	82.3
5	215	7037	39	6593	29	444	82.2	4705	82.3
6	207	7097	40	6643	31	454	81.2	4504	82.1
7	198	7169	37	6693	30	476	81.6	4386	82.0
8	201	7184	37	6716	32	468	81.6	4473	82.0
9	205	7147	38	6675	30	472	81.8	4539	82.0
10	203	7235	38	6759	31	476	81.4	4523	81.9
11	208	7096	38	6624	30	472	81.8	4567	81.9
12	209	7185	41	6709	30	476	80.7	4584	81.8
13	198	7162	41	6680	32	482	79.7	4277	81.6
14	200	7242	43	6757	34	485	78.8	4318	81.4
15	196	7329	41	6842	32	487	79.5	4320	81.3
16	202	7254	44	6769	31	485	78.9	4384	81.2
Ave.	204.2	7160	39	6713	31	447	81.2	4491	N/A
Cumulative Mass Removed (g)							71854		
Cumulative Mass Removed (lb)							158.4		
Total Mass Loaded (lb)							195.2		
Cumulative Removal Efficiency (%)							81.2		

4.5 Sediment Mass Loading

Sediment mass loading for each run was approximately 12.2 lbs on average. These data are summarized in **Table 12**.

Sediment mass loading was calculated from the summation of the total sediment mass added during dosing in each run.

Table 12 Sediment Mass Loading Summary

Run	Sediment Loading (lbs)	Cumulative Sediment Loading (lbs)	Run	Sediment Loading (lbs)	Cumulative Sediment Loading (lbs)
1	12.1	12.1	9	12.2	110.0
2	11.6	23.7	10	12.3	122.2
3	12.4	36.1	11	12.3	134.5
4	12.8	48.9	12	12.5	147.0
5	12.6	61.5	13	11.8	158.9
6	12.2	73.8	14	12.1	170.9
7	11.9	85.6	15	12.0	182.9
8	12.1	97.7	16	12.2	195.2

Overall, a total of 195.2 lbs of sediment was loaded into the Isolator Row PLUS over the course of the 16 runs. Total captured mass over the 16 runs was 158.4 lbs (**Table 11**).

The relationship between removal efficiency and sediment mass loading is shown in **Figure 10**. The relationship between driving head and sediment mass loading is shown in **Figure 11**.

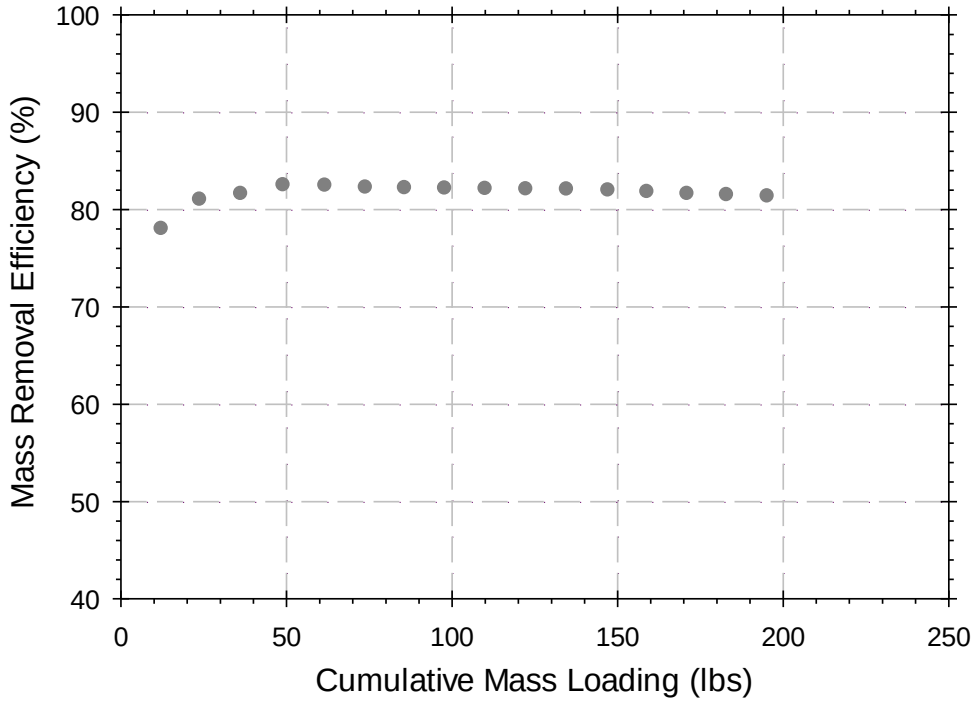


Figure 10 Removal Efficiency vs. Sediment Mass Loading

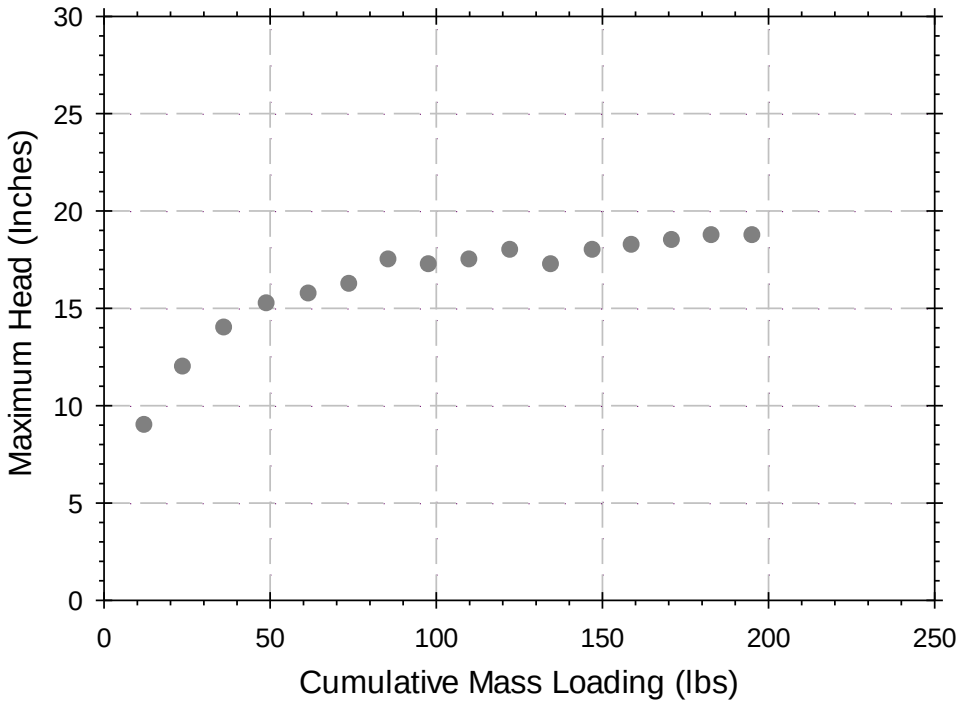


Figure 11 Driving Head vs. Sediment Mass Loading

5. Performance Verification

The Isolator Row PLUS used in this test, constructed from two (2) overlapping StormTech SC-740 chambers and one layer of ADS PLUS fabric, demonstrated a cumulative mass TSS removal efficiency of 81.2% and a sediment mass loading capacity of 3.58 lb./ft^2 (mass capture capacity of 2.91 lb./ft^2) of geotextile fabric filtration area when operated with a driving head < 20 inches at a hydraulic loading rate of 4.13 gpm/ft^2 of geotextile fabric filtration area. The MTFR's and maximum allowable drainage area for other StormTech Isolator Row PLUS models are shown in **Table 13**.

Table 13 Isolator Row PLUS System Model Sizes and New Jersey Treatment Capacities

Model	Surface Loading Rate (gpm/ft^2) Single Chamber	Effective Filtration Treatment Area (ft^2) Single Chamber	MTFR (cfs)[1] Single Chamber	Mass Loading Capacity (lbs) Single Chamber	Mass Capture Capacity (lbs) Single Chamber	Drainage Area (acres) Single Chamber
StormTech SC-160	4.13	11.45	0.105	41.0	33.4	0.06
StormTech SC-310	4.13	17.7	0.163	63.4	51.6	0.09
StormTech SC-740	4.13	27.8	0.256	99.6	81.0	0.14
StormTech DC-780	4.13	27.8	0.256	99.6	81.0	0.14
StormTech MC-3500	4.13	42.9	0.395	153.7	125.0	0.21
StormTech MC-4500	4.13	30.1	0.277	107.8	87.7	0.15

1. Based on 4.13 gpm/ft^2 of effective filtration treatment area.
2. Drainage Area is based on the equation in the NJDEP Filter Protocol wherein drainage area is calculated by dividing the pounds of mass captured by 600 lb/acre.

6. Design Limitations

Maximum Flow Rate

The StormTech Isolator Row PLUS unit has an MTFR of 0.501 cfs (225 gpm) and an effective filtration treatment area (EFTA) of 54.5 ft^2 (loading rate 4.13 gpm/ft^2).

Slope

The StormTech Isolator Row PLUS is recommended for installation with little to no slope to ensure proper, consistent operation. Steep slopes should be reviewed by ADS/StormTech Engineering support.

Allowable Head Loss

There is an operational head loss associated with the StormTech Isolator Row PLUS. The head loss will increase over time due to the sediment loading to the system. Site-specific treatment flow rates, peak flow rates, pipe diameter, and pipe slopes should be evaluated to ensure there is appropriate head for the system to function properly.

Sediment Load Capacity

Based on laboratory testing results, the StormTech Isolator Row PLUS unit has a mass loading capacity of 195.2 lbs. while operating at a sediment removal efficiency of 81.2%; the total sediment load captured by the tested Isolator Row PLUS is 158.4 lbs.

Pre-treatment Requirements

The StormTech Isolator Row PLUS unit does not require additional pre-treatment.

Configurations

The StormTech Isolator Row PLUS is available in multiple configurations. The length and size can be adjusted to meet project specific design volumes or flow rates.

Structure Load Limitations

The StormTech Isolator Row PLUS, as part of the overall chamber system, is designed to meet the full scope of design requirements of the American Society of Testing Materials (ASTM) International specification F2787 "Standard Practice for Structural Design of Thermoplastic Corrugated Wall Stormwater Collection Chambers" and produced to the requirements of the ASTM F2418 "Standard Specification for Polypropylene (PP) Corrugated Stormwater Collection Chambers". The StormTech chambers provide the full AASHTO safety factors for live loads and permanent earth loads. The ASTM F 2787 standard provides specific guidance on how to design thermoplastic chambers in accordance with AASHTO Section 12.12. of the AASHTO LRFD Bridge Design Specifications. ASTM F 2787 requires that the safety factors included in the AASHTO guidance are achieved as a prerequisite to meeting ASTM F 2418. The three standards provide both the assurance of product quality and safe structural design.

7. Maintenance Plan

The frequency of Inspection and Maintenance varies by location. A routine inspection schedule needs to be established for each individual location, based upon site-specific variables. The type of land use (i.e. industrial, commercial, public, residential), anticipated pollutant load, percent imperviousness, climate, rainfall data, etc., all play a critical role in determining the actual frequency of inspection and maintenance practices.

The Isolator Row PLUS may also be part of a treatment train. By treating stormwater prior to entry into the chamber system, the service life can be extended and pollutants such as hydrocarbons can be captured.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row PLUS chamber should be inspected every 6 months for the first year of operation. For subsequent years, the inspection schedule should be adjusted based upon previous observation of sediment deposition.

The Isolator Row PLUS incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the Isolator Row PLUS from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If, upon visual inspection, it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row PLUS, clean-out should be performed.

The Isolator Row PLUS was designed to reduce the cost of periodic maintenance. By "isolating" sediment to just one row of the StormTech system, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout.

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high-pressure water nozzle to propel itself down the Isolator Row PLUS while scouring and suspending sediment. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency.

Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear-facing jets with an effective spread of at least 45" are best. Most JetVac reels have 400 feet of hose, allowing maintenance of an Isolator Row PLUS up to 50 chambers long. The JetVac process should only be performed on StormTech Isolator Rows PLUS that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.

Complete details of the design, operation, and maintenance of the Isolator Row PLUS can be found in the StormTech O&M Manual, available online at:
https://www.stormtech.com/download_files/pdf/11081-stormtech-isolator-row-plus-manual-07-20.pdf

8. Statements

The attached pages include signed statements from the manufacturer (Advanced Drainage Systems, Inc.), the third-party environmental consulting firm (Boggs Environmental Consultants, Inc.), and NJCAT. These statements are included as a requirement for the verification process.

June 26th, 2020

Dr. Richard S. Magee, Sc.D., P.E., BCEE
NJCAT
Center for Environmental Systems
Steven Institute of Technology
Castle Point on Hudson
Hoboken, NJ 07030-0000

Dr. Magee,

Advanced Drainage Systems is pleased to provide this letter as our statement certifying that the protocol, "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a filtration Manufactured Treatment Device" (NJDEP Filter Protocol, January 25, 2013), was strictly followed while testing our StormTech Isolator® Row PLUS. The testing was performed at BaySaver Laboratories, located in Mount Airy, MD. All data pertaining to the StormTech Isolator Row PLUS NJDEP Protocol test is included in the Verification Report.

Respectfully,

Greg Spires, PE
General Manager - StormTech
Advanced Drainage Systems
614.325.0032
greg.spires@ads-pipe.com

BOGGS ENVIRONMENTAL CONSULTANTS

Middletown, MD & Morgantown, WV

Administrative Office:
200 W Main Street
Middletown, Maryland 21769
Office (301) 694-5687
Fax (301) 694-9799

June 25, 2020

StormTech
Advanced Drainage Systems, Inc.
520 Cromwell Avenue
Rocky Hill, CT 06067
gregory.spires@ads-pipe.com

ATTENTION Greg Spires, PE
General Manager, StormTech
Advanced Drainage Systems, Inc.

REFERENCE: Third Party Review of Testing Procedures of the Isolator® Row PLUS at the
BaySaver Laboratory
1207 Park Ridge Drive
Mount Airy, MD 21771

BOGGS ENVIRONMENTAL CONSULTANTS, INC. (BEC) provided Third Party Review services for the testing of the Isolator® Row PLUS to evaluate if the required testing meets certification standards established by the New Jersey Department of Environmental Protection (NJDEP).

LABORATORY TESTING PROCEDURES & METHODOLOGIES

The following two procedures and testing requirements were followed during the testing process of the Isolator® Row PLUS:

- *New Jersey Department of Environmental Protection, Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device, dated January 25, 2013.*
- *QAPP for Isolator® Row PLUS, New Jersey Department of Environmental Protection Testing,* prepared by StormTech (a subsidiary of Advanced Drainage Systems, Inc.), Revision dated January 9, 2020.

ONSITE THIRD-PARTY OBSERVATION OF TESTING PROCEDURES

BEC was present at the BaySaver Laboratory, at 1207 Park Ridge Drive, in Mount Airy, MD 21771, to observe the following testing of the Isolator® Row PLUS:

- The mixing and establishment of a sediment blend that included manufactured sands that when delivered to the feed water would result in influent Total Suspended Solids (TSS) concentrations within the established range of approximately 200 mg/L and a particle size distribution specified and approved by NJDEP;
- BEC assisted in the establishment of a Procedure Checklist to be used on each run to verify and document the following: Verify that pumps and measurement devices are turned on and functioning; Verification that the correct measurements of dry sediments are added to the doser and feed stream; Document that, background effluent, and duplicate samples are collected at established intervals during the run; and, Recording of periodic flow rates and head measurements during each run;
- Observation of Runs 1 through 16 from January 14, 2020 to February 12, 2020 and verified that that sediment, background, effluent samples were collected during each 33-minute run, and that drawdown samples were collected after the end of each run.
- After sampling was completed for each run, BEC was present for the downloading of flow data as well as sediment feed rates to verify that calculated sediment feed rates met NJDEP protocols for testing. BEC also verified that that sample containers were properly labeled and chain of custodies were filled and were boxed and sealed for delivery to Fredericktowne Labs for analysis of Total Suspended Solids (TSS).

THIRD-PARTY VERIFICATION & OPINIONS

Based on observations during the runs and the reported TSS analytical results, BEC verified the following:

- That the testing of the Isolator® Row PLUS at the BaySaver Laboratory was conducted in accordance with the *New Jersey Department of Environmental Protection, Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device, dated January 25, 2013* and procedures established in Advanced Drainage Systems, Inc.'s *QAPP for Isolator® Row PLUS, New Jersey Department of Environmental Protection Testing,* prepared by StormTech (a subsidiary of Advanced Drainage Systems), Revision dated January 9, 2020.
- The report titled *NJCAT Technology Verification, of Isolator® Row PLUS,* prepared by StormTech, dated June 2020, used applicable NJCAT protocol and accurately reflects the testing observed by BEC.

BEC has no financial conflict of interest, as defined in the *Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation of Advanced Technology* (NJEP 2013).

Should you have any questions, contact our office at your earliest convenience.

Sincerely,
BOGGS ENVIRONMENTAL CONSULTANTS, INC.

William R. Warfel
Principal Environmental Scientist

Center for Environmental Systems
Stevens Institute of Technology
One Castle Point
Hoboken, NJ 07030-0000

May 1, 2020

George F. Ives III, P.E.
StormTech, LLC
520 Cromwell Ave
Rocky Hill, CT 06067

Dear Mr. Ives,

Based on my review, evaluation and assessment of the testing conducted on the StormTech , LLC Isolator Row PLUS at the BaySaver Laboratory (Storm Tech, LLC and BaySaver Technologies, LLC are subsidiaries of Advanced Drainage Systems, Inc.), under the independent third-party oversight of Boggs Environmental Consultants (BEC), Inc., the test protocol requirements contained in the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" (NJDEP Filter Protocol, January 2013) were met or exceeded. Specifically:

Test Sediment Feed

The test blend was custom-blended using various commercially available silica sands under the oversight of BEC. The particle size distribution was independently analyzed by Environmental Consulting Services (ECS), using the methodology of ASTM method D422-63. The blended silica met the specification within tolerance as described in Section 5B of the NJDEP filter protocol and was acceptable for use.

Removal Efficiency Testing

Sixteen (16) removal efficiency testing runs were completed in accordance with the NJDEP filter protocol. The target flow rate was 225 gpm and the influent sediment concentration was 200 mg/L. The average flow rate for all 16 runs was 226.1, with a coefficient of variation (COV) below the flow compliance (COV) < 0.1 for all the runs. Likewise, for all runs the sediment feed rate COV was below the < 0.03 protocol limit. The Isolator Row PLUS demonstrated a cumulative sediment removal efficiency of 81.2% over the course of the 16 test runs.

Sediment Mass Loading Capacity

Mass loading capacity testing was conducted concurrently with removal efficiency testing. The Isolator Row PLUS has a mass loading capture capacity of 158.4 lbs (2.91 lbs/ft^2 of filtration area).

No maintenance was performed on the test system during the entire testing program.

Scour Testing

No scour testing was performed. Hence the Isolator Row PLUS is verified for off-line installation only.

Sincerely,

Richard S. Magee, Sc.D., P.E., BCEE

Specifications

Introduction

- Manufacturer – StormTech, LLC, 520 Cromwell Ave, Rocky Hill, CT 06067
- Website: http://www.StormTech.com. Phone: 888-892-2694
- MTD – StormTech Isolator Row PLUS verified models are shown in **Table 13**
- TSS Removal Rate – 81.2%
- Off-line installation

Detailed Specification

• NJDEP sizing tables and physical dimensions of StormTech Isolator Row PLUS verified models are shown in **Table 13**. These sizing tables are valid for NJ following NJDEP Water Quality Design Storm Event of 1.25" in 2 hours (NJAC 7:8-5.5(a)).

• Maximum inflow drainage area

  ◦ The maximum inflow drainage area is governed by the maximum treatment flow rate of each model as presented in **Table 13**.

• Driving head will vary for a given Isolator Row PLUS model based on the site-specific configuration. The maximum head without bypass is 36”, but the minimum head varies depending on the flow rate through the unit. Design support is given by StormTech for each project, and site-specific drawings (cut sheets) will be provided that show pipe inverts, finish surface elevation, and peak treatment and maximum flow rates through the unit.

• The drawdown flow exits via the underdrain. A clean filter draws down in approximately 20 minutes.

Recharge Volume Calculations (Static Method)

Bell Pond Improvements
Worcester, MA
March 22, 2023

Infiltration Basin (IB-1) Required Recharge Volume						
Hydrologic Soils Group:	**A**	**B**	**C**	**D**	**Total**	
Total Proposed Impervious Area:	0	0	40,607	0	40,607	(SF)
Target Factor:	0.60	0.35	0.25	0.10		
Recharge Volume:	0	0	846	0	846	(CF)
Adjusted Recharge Volume*:					1,269	(CF)

* 27,017-SF of proposed impervious area will be captured by the recharge BMP

Provided Recharge Volume		
Elevation of Lowest Invert:	668.60	(FT)
Volume Below Lowest Outlet:	1,272	(CF)

Drawdown Time		
Saturated Hydraulic Conductivity (Rawls Rate):	0.27	(IN/HR)
Bottom Area of Infiltration Basin:	1,858	(SF)
Drawdown Time:	30.4	(HRS)

Water Quality Volume Calculations

Bell Pond Improvements
Worcester, MA
March 22, 2023

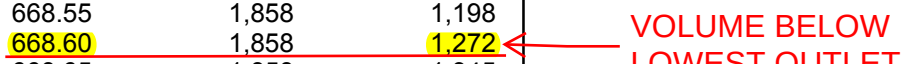
Required Water Quality Storage Calculation

Proposed Impervious Area (SF) x 0.5-IN x 1-FT/12-IN = Required WQV

Location	Area (SF)	Required WQV (CF)	Provided WQV (CF)	BMP Description
Parking Lot	27,017	1,126	1,272	Infiltration System (IS-1)

Stage-Area-Storage for Pond IS-1: IS-1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
667.50	**1,858**	0
667.55	1,858	37
667.60	1,858	74
667.65	1,858	111
667.70	1,858	149
667.75	1,858	186
667.80	1,858	223
667.85	1,858	260
667.90	1,858	297
667.95	1,858	334
668.00	1,858	372
668.05	1,858	448
668.10	1,858	524
668.15	1,858	600
668.20	1,858	675
668.25	1,858	751
668.30	1,858	826
668.35	1,858	901
668.40	1,858	976
668.45	1,858	1,050
668.50	1,858	1,124
668.55	1,858	1,198
668.60	1,858	1,272
668.65	1,858	1,345
668.70	1,858	1,418
668.75	1,858	1,490
668.80	1,858	1,562
668.85	1,858	1,634
668.90	1,858	1,705
668.95	1,858	1,776
669.00	1,858	1,847
669.05	1,858	1,917
669.10	1,858	1,986
669.15	1,858	2,055
669.20	1,858	2,123
669.25	1,858	2,191
669.30	1,858	2,259
669.35	1,858	2,325
669.40	1,858	2,392
669.45	1,858	2,457
669.50	1,858	2,522
669.55	1,858	2,586
669.60	1,858	2,650
669.65	1,858	2,712
669.70	1,858	2,774
669.75	1,858	2,835
669.80	1,858	2,894
669.85	1,858	2,953
669.90	1,858	3,011
669.95	1,858	3,068
670.00	1,858	3,124
670.05	1,858	3,178
670.10	1,858	3,231
670.15	1,858	3,282
670.20	1,858	3,331
670.25	1,858	3,378
670.30	1,858	3,421
670.35	1,858	3,463
670.40	1,858	3,503
670.45	1,858	3,542
670.50	1,858	3,580
670.55	1,858	3,617
670.60	1,858	3,654
670.65	1,858	3,691
670.70	1,858	3,728
670.75	1,858	3,766
670.80	1,858	3,803
670.85	1,858	3,840
670.90	1,858	3,877
670.95	1,858	3,914
671.00	1,858	**3,951**



Attachment F - Long Term Pollution Prevention Plan

Long Term Pollution Prevention Plan

To meet the requirements of Standard 4 of the Massachusetts Stormwater Handbook, this Long Term Pollution Prevention Plan is provided to identify the proper procedures of practices for source control and pollution prevention.

Storage and Handling of Oil and other Hazardous Materials

Any hazardous materials that will be used ancillary to the site will be stored inside, or off site.

Spill Prevention/Response

Spill kits will be kept at a local City facility, and spills shall be cleaned up immediately. Spills of any hazardous material over 10 gallons will be reported to the Massachusetts Department of Environmental Protection within 24 hours.

Operation and Maintenance of Stormwater Control Structures

Included in Attachment H of this appendix is the Operation and Maintenance plan for this site, which includes periodic cleaning of stormwater infrastructure. The City of Worcester Department of Public Works & Parks (DPW) will be responsible for the implementation of the plan.

Landscaping

The landscaped areas will be maintained by the City of Worcester DPW. Use of fertilizers, herbicides, and pesticides shall be allowed for all vegetated areas on site. If kept on site, all chemicals shall be stored under cover. Any storage for fertilizers, herbicides and pesticides shall not be located within 100 feet of any wetland or within proximity to the stormwater management system where spills could enter the storm drain system.

Septic System

There will be no onsite septic facilities.

Vehicle Washing

Vehicle washing shall not be performed on site. Vehicles can be rinsed with a high volume of water at low pressure. This is considered dust water by the DEP and accounts for what may be rinsed off the vehicle when it rains.

Non-Hazardous Waste Management/Good Housekeeping Practices

All non-hazardous waste shall be stored in designated trash or recycling containers onsite for periodic collection by the local trash collector. The City of Worcester DPW shall have maintenance staff who monitor the site for the accumulation of trash. Any trash that is seen onsite shall immediately be collected and placed into designated trash or recycling containers. The DPW's maintenance staff shall inspect the site once per week at minimum.

Prohibition of Illicit Discharges

Illicit discharges to the onsite stormwater management system shall be strictly prohibited. Illicit discharges are defined as any direct or indirect non-stormwater discharge to the onsite stormwater system. Requirements related to Illicit Discharges are further detailed in the attached Illicit Discharge Compliance Statement in Attachment I.

De-icing & Snow Disposal

The operation will utilize salt and sand to treat the existing paved surfaces of the site during snow and ice events. Snow will be temporarily stored within peripheral areas of the site and allowed to melt and drain back to onsite stormwater systems. When needed, snow shall be removed from the site and disposed of in accordance with all local, state and federal regulations. Snow storage shall be prohibited within all wetlands and wetland buffer zones.

Winter Sand/Salt Use & Storage

Any sand and/or salt to be used for de-icing purposes shall be stored inside or under cover and stabilized to prevent the discharge into nearby wetlands or waterbodies.

Emergency Contact Information

Owner/Operator:
City of Worcester Department of Public Works & Parks
Jay Fink, PE
DPW Commissioner
20 East Worcester Street
Worcester, MA 01604
508-929-1300

Engineer:
James Pearson, PE
Weston & Sampson, Inc.
55 Walkers Brook Drive, Suite 100
Reading, MA 01867
978-532-1900

Attachment G - Construction Period Pollution and Erosion and Sedimentation Control Plan

Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan

SECTION 1: Introduction

The City of Worcester proposes to redevelop Bell Hill Park located at 196 Belmont Street in Worcester. Site improvements will include construction of a new parking lot, basketball court, playground and beach amenities. Work will also include grading, landscaping, and the installation of new drainage infrastructure.

As part of this project, this "Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan" has been created to ensure that onsite erosion is prevented and sediment is controlled to prevent it from leaving the site.

SECTION 2: Construction Period Pollution Prevention Measures

Best Management Practices (BMPs) will be utilized as Construction Period Pollution Prevention Measures to reduce potential pollutants and prevent any off-site discharge. The objectives of the BMPs for construction activity are to minimize the disturbed areas, stabilize any disturbed areas, control the site perimeter and retain sediment. Both erosion and sedimentation controls and non-stormwater best management measures will be used to minimize site disturbance and ensure compliance with the performance standards of the WPA and Stormwater Standards. Measures will be taken to minimize the area disturbed by construction activities to reduce the potential for soil erosion and stormwater pollution problems. All pollution prevention and erosion control measures which are required on the site plans and in the SWPPP shall be followed along with the guidance in this document. In addition, good housekeeping measures will be followed for the day-to-day operation of the construction site under the control of the contractor to minimize the impact of construction. This section describes the control practices that will be in place during construction activities. All recommended control practices will comply with the standards set in the MA DEP Stormwater Policy Handbook.

2.1 Minimize Disturbed Area and Protect Natural Features and Soil

In order to minimize disturbed areas all work will be completed within well-defined work limits. These work limits are shown on the construction plans. The Contractor shall not disturb native vegetation in the undisturbed wooded area without prior approval from the Engineer. The Contractor will be responsible to make sure that all workers know the proper work limits and do not extend their work into the undisturbed areas. The protective measures are described in more detail in the following sections.

2.2 Control Stormwater Flowing onto and through the project

All construction areas adjacent to drainage features will be lined with compost filter tubes and silt fence. The tubes and silt fence will be inspected daily and accumulated silt will be removed as appropriate. In addition, any storage of material will require a second level of protection by surrounding the areas with another row of compost filter tubes. A stabilized construction entrance/exit is proposed so that equipment visiting the site can remove any accumulated dirt and mud from vehicles to prevent tracking the mud onto public roads.

2.3 Stabilize Soils

The Contractor shall limit the area of land which is exposed and free from vegetation during construction. In areas where the period of exposure will be greater than two (2) months, mulching, the use of erosion control mats, or other protective measures shall be provided as specified.

The Contractor shall take account of the conditions of the soil where erosion control seeding will take place to ensure that materials used for re-vegetation are adaptive to the sediment control.

Following the completion of construction, embankment areas will be finished with topsoil and seed. Slopes in excess of 3H:1V will be stabilized with erosion matting to prevent erosion during the interim period in which vegetation is being established. The overland areas of the proposed construction staging areas will also be re-seeded.

2.4 Proper storage and cover of any stockpiles

The location of the Contractor's storage areas for equipment and/or materials shall be upon cleared portions of the job site or areas to be cleared as a part of this project and shall require written approval of the Engineer.

Adequate measures for erosion and sediment control such as the placement of compost filter tubes around the downstream perimeter of stockpiles shall be employed to protect any downstream areas from siltation.

The Engineer may designate a particular area or areas where the Contractor may store materials used in his operations.

2.5 Perimeter Controls and Sediment Barriers

Erosion control lines as described in Section 5 will be utilized to ensure that no sedimentation occurs outside the perimeter of the work area.

2.6 Storm Drain Inlet Protection

Storm drain inlets will be protected from sediment.

2.7 Retain Sediment On-Site

The Contractor will be responsible to monitor all erosion control measures. Whenever necessary the Contractor will clear all sediment from the compost filter tubes and silt fence that have been silted up during construction. Daily monitoring should be conducted using the attached Monitoring Form.

The following good housekeeping practices will be followed on-site during the construction project.

2.8 Material Handling and Waste Management

All materials stored on-site will be stored in a neat, orderly manner in appropriate containers. All materials will be kept in their original containers with the original manufacturer's label. Substances will not be mixed with one another unless recommended by the manufacturer.

All waste materials will be collected and stored in a securely lidded metal container from a licensed management company. The waste and any construction debris from the site will be hauled off-site daily and disposed of properly. The contractor will be responsible for all waste removal. Manufacturer's recommendations for proper use and disposal will be followed for all materials. Sanitary waste will be collected from the portable units a minimum of once a week, by a licensed sanitary waste management contractor.

2.9 Designated Washout Areas

The Contractor shall perform washout into contained areas designated for that purpose to prevent cement-laden water from leaving the site.

2.10 Proper Equipment/Vehicle Fueling and Maintenance Practices

On-site vehicles will be monitored for leaks and receive regular preventative maintenance to reduce the risk of leakage. To ensure that leaks on stored equipment do not contaminate the site, oil-absorbing mats will be placed under all equipment during storage. Regular fueling and service of the equipment may be performed using approved methods and with care taken to minimize chance of spills. Any petroleum products will be stored in tightly sealed containers that are clearly labeled.

2.11 Equipment/Vehicle Washing

The Contractor will be responsible to ensure that no equipment is washed on-site.

SECTION 3: Spill Prevention and Control Plan

The Contractor will be responsible for preventing spills in accordance with the project specifications and applicable federal, state, and local regulations. The Contractor will identify a properly trained site employee, involved with the day-to-day site operations to be the spill prevention and cleanup coordinator. The name(s) of the responsible spill personnel will be posted on-site. Each employee will be instructed that all spills are to be reported to the spill prevention and cleanup coordinator.

3.1 Spill Control Equipment

Spill control/containment equipment will be kept in the Work Area. Materials and equipment necessary for spill cleanup will be kept either in the Work Area or in an otherwise accessible on-site location. Equipment and materials will include, but not be limited to, absorbent booms/mats, brooms, dust pans, mops, rags, gloves, goggles, sand, plastic and metal containers specifically for this purpose. It is the responsibility of the Contractor to ensure the inventory will be readily accessible and maintained.

3.2 Notification

All workers will be directed to inform the on-site supervisor of a spill event. The supervisor will assess the incident and initiate proper containment and response procedures immediately upon notification. Workers should avoid direct contact with spilled materials during the containment procedures. Primary notification of a spill should be made to the local Fire Department and Police Departments. Secondary Notification will be to the certified cleanup contractor if deemed necessary by Fire and/or Police personnel. The third level of notification is to the DEP. The specific cleanup contractor to be used will be identified by the Contractor prior to commencement of construction activities.

3.3 Spill Containment and Clean-Up Measures

Spills will be contained with granular sorbent material, sand, sorbent pads, booms or all of the above to prevent spreading. Certified cleanup contractors should complete spill cleanup. The material manufacturer's recommended methods for spill cleanup will be clearly posted and on-site personnel will be made aware of the procedures and the location of the information and cleanup supplies.

3.4 Hazardous Materials Spill Report

The Contractor will report and record any spill. The spill report will present a description of the release, including the quantity and type of material, date of the spill, circumstances leading to the release, location of spill, response actions and personnel, documentation of notifications and corrective measures implemented to prevent reoccurrence.

This document does not relieve the Contractor of the Federal reporting requirements of 40 CFR Part 110, 40 CFR Part 117, 40 CFR Part 302 and the State requirements specified under the Massachusetts Contingency Plan (M.C.P) relating to spills or other releases of oils or hazardous substances. Where a release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Part 110, 40 CFR Part 117 or 40 CFR Part 302, occurs during a twenty-four (24) hour period, the Contractor is required to comply with the response requirements of the above mentioned regulations. Spills of oil or hazardous material in excess of the reportable quantity will be reported to the National Response Center (NRC).

SECTION 4: Contact Information/Responsible Parties

Owner/Operator:
City of Worcester Department of Public Works & Parks
Jay Fink, PE
DPW Commissioner
20 East Worcester Street
Worcester, MA 01604
508-929-1300

Engineer:
James Pearson, PE
Weston & Sampson, Inc.
55 Walkers Brook Drive, Suite 100
Reading, MA 01867
978-532-1900

Site Inspector:
TBD

Contractor:
TBD

SECTION 5: Erosion and Sedimentation Control

Erosion and Sedimentation Controls are shown on the project plans. A Stormwater Pollution Prevention Plan (SWPPP) will be required for this project in accordance with EPA regulations. The contractor shall refer to the SWPPP for additional requirements.

SECTION 6: Site Development Plans

A full set of site development plans are included with this submittal.

SECTION 7: Operation and Maintenance of Erosion Control

If there is a failure to the controls the Contractor, under the supervision of the Engineer, will be required to stop work until the failure is repaired.

Periodically throughout the work, whenever the Engineer deems it necessary, the sediment that has been deposited against the controls will be removed to ensure that the controls are working properly.

SECTION 8: Inspection Schedule

During construction the erosion and sedimentation controls will be inspected daily. Once the Contractor is selected, an on-site inspector will be selected to work closely with the Engineer to insure that all erosion and sedimentation controls are in place and working properly. An Inspection Form is included.

Inspection Form

Inspected By: _____ Date: _____ Time: _____

YES	NO	DOES NOT APPLY	ITEM
			Do any erosion/siltation control measures require repair or clean out to maintain adequate function?
			Is there any evidence that sediment is leaving the site and entering the wetlands?
			Are any temporary soil stockpiles or construction materials located in non-approved areas?
			Are on-site construction traffic routes, parking, and storage of equipment and supplies located in areas not specifically designed for them?
			Is there any evidence that sediment is entering stormwater management systems?

Specific location, current weather conditions, and action to be taken:

_____

_____

_____

_____

_____

_____

Other Comments:

_____

_____

_____

Pending the actions noted above I certify that the site is in compliance with the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan.

Signature: _____ Date: _____

Attachment H - Operations and Maintenance Plan

Operations & Maintenance Plan

1.0 Introductiont

The following document has been written to comply with the stormwater guidelines set forth by the Massachusetts Department of Environmental Protection (MassDEP). The intent of these guidelines is to encourage Low Impact Development techniques to improve the quality of the stormwater runoff. These techniques, also known as Best Management Practices (BMPs) collect, store, and treat the runoff before discharging to adjacent environmental resources.

2.0 Purpose

This Operations & Maintenance Plan (O&M Plan) is intended to provide a mechanism for the consistent inspection and maintenance of each BMP installed on the project site. Included in this O&M Plan is a description of the BMP type and an inspection form for the BMP. The City of Worcester Department of Public Works & Parks is the owner and operator of the system and is responsible for its upkeep and maintenance. This work will be funded on an annual basis through the owner's operating budget.

In the event the Owner sells the property, it is the Owner's responsibility to transfer this plan as well as the past operation and maintenance records to the new property owner.

3.0 BMP Descriptions

3.1 Deep Sump Hooded Catch Basins

Deep sump hooded catch basins are utilized as pretreatment devices and are designed to remove trash, debris, sediments, and hydrocarbons from stormwater runoff.

3.2 Outlet Control Structures

Outlet control structures are used to control stormwater discharges from stormwater management infrastructure and release the stormwater in such a manner to control peak discharge rates and velocities.

3.3 Subsurface Chamber Systems

Subsurface chamber systems are used to provide stormwater treatment, detention, and groundwater recharge to mitigate peak stormwater discharges and remove total suspended solids from the stormwater runoff.

3.4 Stormtech Isolator Row Plus

The Stormtech Isolator Row Plus is a pretreatment device built into the subsurface chamber system to remove total suspended solids from stormwater runoff. It consists of a row of Stormtech subsurface chambers wrapped in two layers of geotextile fabric.

4.0 Inspection, Maintenance Checklist, and Schedule

4.1 Deep Sump Hooded Catch Basins and Outlet Control Structures

Inspect and/or clean catch basins and outlet control structures at least four times per year and at the end of foliage and snow removal seasons. Sediments must be removed whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin. The structures should be cleaned a minimum of four times per year regardless of the amount of sediment in the basin. The site is considered a land use with a higher potential pollutant load, therefore if catch basins are found to be filled to capacity with sediment during a cleaning, the frequency of cleaning shall be increased. Catch basins and outlet control structures shall be cleaned with clamshell buckets or by hand tools where necessary. Hoods shall be inspected annually. Open and close the access hatch and flush or rod the anti-siphon device to ensure proper operation.

In the event of contamination by a spill or other means, all cleanings must be evaluated in accordance with the Hazardous Waste Regulations, 310 CMR 30.000 and handled as hazardous waste.

In the absence of evidence of contamination, catch basin cleanings may be taken to a landfill or other facility permitted by MassDEP to accept Solid Waste without any prior approval by MassDEP. Please note that current MassDEP regulations prevent landfills from accepting materials that contain free-draining liquids.

4.2 Stormtech Subsurface Chamber Systems and Isolator Row Plus

Stormtech subsurface chambers shall be inspected every three months for the first year, then timed thereafter based upon the depth of sediment build up witnessed in the previous inspections. Inspections shall occur annually at a minimum. Inspection ports shall be located strategically throughout the isolator row system. When sediment is observed, the depth shall be recorded with a stadia rod, and when that average depth across the isolator row chambers reaches 3-inches, the system shall be cleaned out. More frequent maintenance may be required based upon the rate of sediment accumulation.

Cleaning is performed through the Jet-vac process whereby the isolator row chambers are washed with a high-pressure water system and the captured pollutants are then vacuumed out.

Refer to the attached Stormtech Operations and Maintenance document for additional information.

4.3 Inspections and Record Keeping

- An inspection form should be filled out each, and every time maintenance work is performed.
- A binder should be kept that contains all of the completed inspection forms and any other related materials.
- A review of Operation & Maintenance actions should take place annually such that the Stormwater BMPs are being taken care of in the manner illustrated in this Operation & Maintenance Plan.
- Operation & Maintenance log forms for the last three years, at a minimum, shall be kept on site.
- The inspection and maintenance schedule may be refined in the future based on the findings and results of this Operation & Maintenance program or policy.

5.0 Public Safety Features

No public safety features will be necessary.

6.0 Stormwater Management System Owner/Responsible Party

The stormwater management system shall be owned and maintained by the following party or its future designee/assigns:

City of Worcester Department of Public Works & Parks
20 East Worcester Street
Worcester, MA 01604

This operation and Maintenance Plan will be recorded with the registry of deeds so that current and future owners are aware of the requirement for proper operation and maintenance of the onsite stormwater system.

7.0 General Good Housekeeping Practices

All non-hazardous waste shall be stored in designated trash or recycling containers onsite for periodic collection by the local trash collector. The owner shall have maintenance staff who monitor the site for the accumulation of trash. Any trash that is seen onsite shall immediately be collected and placed into designated trash

or recycling containers. The owner's maintenance staff shall make an inspection of the site once per week at minimum.

8.0 Estimated Operations and Maintenance Budget

The estimated budget for annual operations and maintenance of this stormwater system is $3,000 per year.

Deep Sump Hooded Catch Basins & Outlet Control Structures

Frequency: Inspect every three months, primarily in the spring and fall.

Structure Number: _____

Inspected By: _____ Date: _____

Observations: _____
_____
_____

Actions Taken: _____
_____
_____

Instructions: Clean structures four times per year or whenever the depth of the deposits is greater than or equal to one half the depth from the bottom of the invert to the lowest pipe in the structure. Open and close hood and check anti-siphon vent for clogging. All trash, debris, and sediments should be disposed of in accordance with local, state, and federal regulations.

Subsurface Chamber System & Isolator Row Plus

Frequency: Inspect every six months for the first year, then timed thereafter based upon the depth of sediment build up witnessed in the previous inspections. Inspections shall occur annually at a minimum. More frequent inspections may be required based upon rate of sediment accumulation.

Structure Number: _____

Inspected By: _____ Date: _____

Observations: _____
_____
_____

Actions Taken: _____
_____
_____

Instructions: Clean the system whenever the depth of the deposits averages three inches in depth across the bottom of the chambers. Inspect chambers via manholes or inspection ports. Use reverse water jet to pull sediment back into manhole. Remove sediment, trash and debris as noted above. All trash, debris, and sediments should be disposed of in accordance with local, state, and federal regulations.

StormTech
Detention • Retention • Water Quality
An ADS company

Isolator® Row O&M Manual

THE MOST ADVANCED NAME IN WATER MANAGEMENT SOLUTIONS™

ADS®

THE ISOLATOR® ROW

INTRODUCTION

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row is a technique to inexpensively enhance Total Suspended Solids (TSS) removal and provide easy access for inspection and maintenance.

THE ISOLATOR ROW

The Isolator Row is a row of StormTech chambers, either SC-160LP, SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-4500 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row and ultimately passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC- 310-3 and SC-740 models) allow storm water to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

Two different fabrics are used for the Isolator Row. A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The tough geotextile provides a media for storm water filtration and provides a durable surface for maintenance operations. It is also designed to prevent scour of the underlying stone and remain intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber. The non-woven fabric is not required over the SC-160LP, DC-780, MC-3500 or MC-4500 models as these chambers do not have perforated side walls.

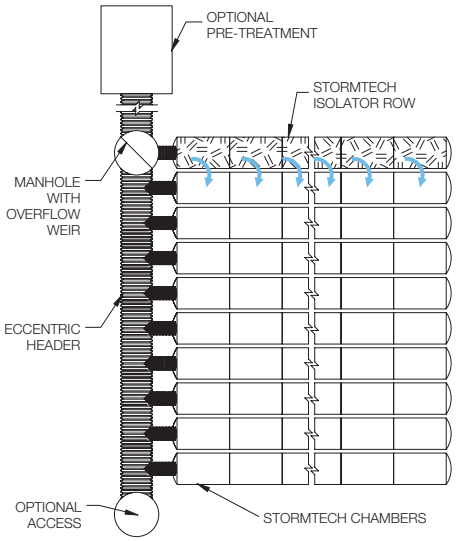
The Isolator Row is typically designed to capture the “first flush” and offers the versatility to be sized on a volume basis or flow rate basis. An upstream manhole not only provides access to the Isolator Row but typically includes a high flow weir such that storm water flowrates or volumes that exceed the capacity of the Isolator Row overtop the over flow weir and discharge through a manifold to the other chambers.

The Isolator Row may also be part of a treatment train. By treating storm water prior to entry into the chamber system, the service life can be extended and pollutants such as hydrocarbons can be captured. Pre-treatment best management practices can be as simple as deep sump catch basins, oil-water separators or can be innovative storm water treatment devices. The design of the treatment train and selection of pretreatment devices by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, the Isolator Row is recommended by StormTech as an effective means to minimize maintenance requirements and maintenance costs.

Note: See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row.

Looking down the Isolator Row from the manhole opening, woven geotextile is shown between the chamber and stone base.

StormTech Isolator Row with Overflow Spillway (not to scale)



ISOLATOR ROW INSPECTION/MAINTENANCE

INSPECTION

The frequency of inspection and maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

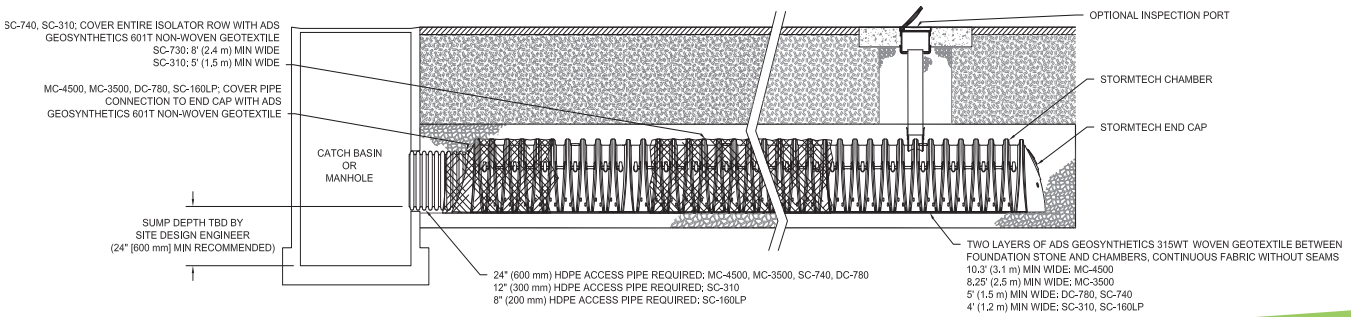
MAINTENANCE

The Isolator Row was designed to reduce the cost of periodic maintenance. By "isolating" sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45" are best. Most JetVac reels have 400 feet of hose allowing maintenance of an Isolator Row up to 50 chambers long. **The JetVac process shall only be performed on StormTech Isolator Rows that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.**

StormTech Isolator Row (not to scale)

Note: Non-woven fabric is only required over the inlet pipe connection into the end cap for SC-160LP, DC-780, MC-3500 and MC-4500 chamber models and is not required over the entire Isolator Row.



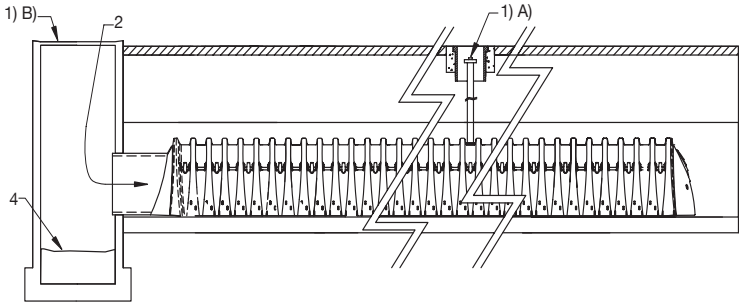
ISOLATOR ROW STEP BY STEP MAINTENANCE PROCEDURES

STEP 1
Inspect Isolator Row for sediment.
- A) Inspection ports (if present)
  - i. Remove lid from floor box frame
  - ii. Remove cap from inspection riser
  - iii. Using a flashlight and stadia rod,measure depth of sediment and record results on maintenance log.
  - iv. If sediment is at or above 3 inch depth, proceed to Step 2. If not, proceed to Step 3.
- B) All Isolator Rows
  - i. Remove cover from manhole at upstream end of Isolator Row
  - ii. Using a flashlight, inspect down Isolator Row through outlet pipe
    1. Mirrors on poles or cameras may be used to avoid a confined space entry
    2. Follow OSHA regulations for confined space entry if entering manhole
  - iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches), proceed to Step 2. If not, proceed to Step 3.

STEP 2
Clean out Isolator Row using the JetVac process.
- A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
- B) Apply multiple passes of JetVac until backflush water is clean
- C) Vacuum manhole sump as required

STEP 3
Replace all caps, lids and covers, record observations and actions.

STEP 4
Inspect & clean catch basins and manholes upstream of the StormTech system.



SAMPLE MAINTENANCE LOG

Date	Stadia Rod Readings		Sediment Depth (1)–(2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/11	6.3 ft	none		New installation. Fixed point is CI frame at grade	DJM
9/24/11		6.2	0.1 ft	Some grit felt	SM
6/20/13		5.8	0.5 ft	Mucky feel, debris visible in manhole and in Isolator Row, maintenance due	NV
7/7/13	6.3 ft		0	System jetted and vacuumed	DJM

StormTech® Detention • Retention • Water Quality
A division of ADS

Advanced Drainage Systems, Inc.
4640 Trueman Blvd., Hilliard, OH 43026
1-800-821-6710 www.ads-pipe.com

Attachment I – Illicit Discharge Compliance Statement

Illicit Discharge Compliance Statement

Section I – Purpose/Intent

The purpose of this document is to provide for the health, safety, and general welfare of the citizens of Massachusetts through the regulation of non-stormwater discharges into existing outstanding resource areas near the site to the maximum extent practicable, as required by federal and state law. To the best of our knowledge and belief, there are no illicit discharges occurring under existing conditions on this site within the meaning expressed under Standard 10 of the Massachusetts Stormwater Handbook. This document establishes methods for controlling the introduction of pollutants into existing outstanding resource areas to comply with requirements of the National Pollutant Discharge Elimination System (NPDES) permit process.

Section II - Definitions

For the purposes of this statement, the following shall mean:

Best Management Practices (BMPs): Schedules of activities, prohibitions of practices, general good housekeeping practices, pollution prevention and educational practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants directly or indirectly to stormwater, receiving waters, or stormwater conveyance systems. BMPs also include treatment practices, operating procedures, and practices to control site runoff, spillage or leaks, sludge or water disposal, or drainage from raw materials storage.

Clean Water Act: The federal Water Pollution Control Act (33 U.S.C § 1251 et seq.), and any subsequent amendments thereto.

Construction Activity: Activities subject to the Massachusetts Erosion and Sedimentation Control Act or NPDES Construction Permits. Such activities include but are not limited to clearing and grubbing, grading, excavating, and demolition.

Hazardous Materials: Any material, including any substance, waste, or combination thereof, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to, a substantial present or potential hazard to human health, safety, property, or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Illegal Connection: An illegal connection is defined as either of the following:

a. Any pipe, open channel, drain or conveyance, whether on the surface or subsurface, which allows an illicit discharge to enter the outstanding resource area including but not limited to any conveyances which allow any non-stormwater

discharge including sewage, process wastewater, and wash water, regardless of whether said drain or connection has been previously allowed, permitted, or approved by an authorized enforcement agency; or

b. Any pipe, open channel, drain or conveyance connected to the City of Worcester storm water treatment system which has not been documented in plans, maps, or equivalent records and approved by an authorized enforcement agency.

Illicit Discharge: Any direct or indirect non-stormwater discharge to the City of Worcester stormwater treatment system, except as exempted in Section III of this ordinance.

Industrial Activity: Activities subject to NPDES Industrial Permits as defined in 40CFR, Section 122.26 (b) (14).

National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Permit: A permit issued by MassDEP under authority delegated pursuant to 33 USC § 1342 (b) that authorizes the discharge of pollutants to waters of the United States, whether the permit is applicable on an individual, group, or general area-wide basis.

City of Worcester Stormwater Treatment System: Any facility, owned or maintained by the City of Worcester, designed or used for collecting and/or conveying stormwater, including but not limited to roads with drainage systems, City of Worcester streets, curbs, gutters, inlets, catch basins, piped storm drains, pumping facilities, infiltration, retention and detention basins, natural and man-made or altered drainage channels, reservoirs, and other drainage structures.

Non-Stormwater Discharge: Any discharge to the storm drain system that is not composed entirely of stormwater.

Person: Any individual, association, organization, partnership, firm, joint venture, public or private corporation, trust, estate, commission, board, public or private institution, utility, cooperative, city, county or other political subdivision of the State, interstate body, or any other legal entity.

Pollutant: Anything which causes or contributes to pollution. Pollutants may include, but are not limited to: paints, varnishes, and solvents; petroleum hydrocarbons; automotive fluids; cooking grease; detergents (biodegradable or otherwise); degreasers; cleaning chemicals; non-hazardous liquid and solid wastes; refuse, rubbish, garbage, litter, or other discarded or abandoned objects and accumulations, so that same may cause or contribute to pollution; floatables; pesticides, herbicides, and fertilizers; liquid and solid wastes; sewage, fecal coliform and pathogens; dissolved and particulate metals; animal wastes; wastes and residues that result from constructing a building or structure; concrete and cement; and noxious or offensive matter of any kind.

Pollution: Contamination or other alteration of any water's physical, chemical, or biological properties by addition of any constituent including but not limited to a change in temperature, taste, color, turbidity, or odor of such waters, or the discharge of any liquid,

gaseous, solid, radioactive, or other substance into any such waters as will or is likely to create a nuisance or render such waters harmful, detrimental, or injurious to the public health, safety, welfare, or environment, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life.

Premises: Any building, lot, parcel of land, or portion of land whether improved or unimproved including adjacent sidewalks and parking strips.

Stormwater: Any surface flow, runoff, and drainage consisting entirely of water from any form of natural precipitation and resulting from such precipitation.

Wastewater: Any water or other liquid discharged from a facility, that has been used, as for washing, flushing, or in a manufacturing process, and so contains waste products.

Section III - Prohibitions

Prohibition of Illicit Discharges:

No person shall throw, drain, or otherwise discharge, cause or allow others under its control to throw, drain, or otherwise discharge into the City of Worcester stormwater treatment system or watercourses any materials, including but not limited to, any pollutants or waters containing any pollutants, other than stormwater. It is to the best knowledge and belief of the project proponent that no illicit discharges currently exist at the project site. The commencement, conduct or continuance of any illicit discharge to the storm drain system is prohibited except as described as follows:

1. Water line flushing performed by a government agency, other potable water sources, landscape irrigation or lawn watering, diverted stream flows, rising ground water, ground water infiltration to storm drains, uncontaminated pumped ground water, foundation or footing drains (not including active groundwater dewatering systems), crawl space pumps, air conditioning condensation, springs, natural riparian habitat or wetland flows, and any other water source not containing pollutants;

2. Discharges or flows from fire fighting, and other discharges specified in writing by the City of Worcester as being necessary to protect public health and safety;

3. Dye testing is an allowable discharge, but requires notification to the City of Worcester prior to the time of the test;

4. Any non-stormwater discharge permitted under an NPDES permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the Federal Environmental Protection Agency, provided that the discharger is in full compliance with all requirements of the permit, waiver, or order and other applicable laws and regulations, and provided that written approval has been granted for a discharge to the City of Worcester stormwater treatment system.

Section IV - Industrial or Construction Activity Discharges

Any person subject to an industrial or construction activity NPDES stormwater discharge permit shall comply with all provisions of such permit. Proof of compliance with said permit may be required in a form acceptable to the City of Worcester prior to allowing discharges to the City of Worcester stormwater treatment system.

Section V - Notification of Spills and Accidental Discharges

Notwithstanding other requirements of law, as soon as any person responsible for a facility, activity or operation, or responsible for emergency response for a facility, activity or operation has information of any known or suspected release of pollutants or non-stormwater discharges from that facility, activity, or operation which are resulting or may result in illicit discharges or pollutants discharging into stormwater, the City of Worcester stormwater treatment system, State Waters, or Waters of the U.S., said person shall take all necessary steps to ensure the discovery, containment, and cleanup of such release so as to minimize the effects of the discharge. In the event of such a release of hazardous materials, said person shall immediately notify emergency response agencies of the occurrence via emergency dispatch services. In the event of a release of non-hazardous materials, said person shall notify the City of Worcester DPW in person or by phone no later than the next business day, including the nature, quantity and time of occurrence of the discharge. Notifications in person or by phone shall be confirmed by written notice, via certified mail return receipt requested addressed to the City of Worcester DPW within three (3) business days of the initial notice. If the discharge of prohibited materials emanates from a commercial or industrial establishment, the owner or operator of such establishment shall also retain an on-site written record of the discharge and the actions taken to prevent its recurrence. Such records shall be retained for at least three years.

IN WITNESS WHEREOF the parties hereto have executed copies of this Agreement on the _____ day of _____, _____.

_____

APPENDIX C

Path: P:\MA\Worcester MA\ENG22-0194 Bell Pond Improvements\Wetland Delineation\GIS\1-Delineation Map.mxd **User:** Kearns.Megan **Saved:** 3/17/2023 9:31:43 AM **Opened:** 3/17/2023 9:32:38 AM

Legend

- Bank
- BVW
- Work Area

N
W E
S

0 50 100 200 Feet

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

FIGURE 1

Bell Pond
Worcester, MA

Wetland Delineation
Map

Weston & Sampson

N
W E
S

0 600 1,200 2,400 Feet

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

Work Area

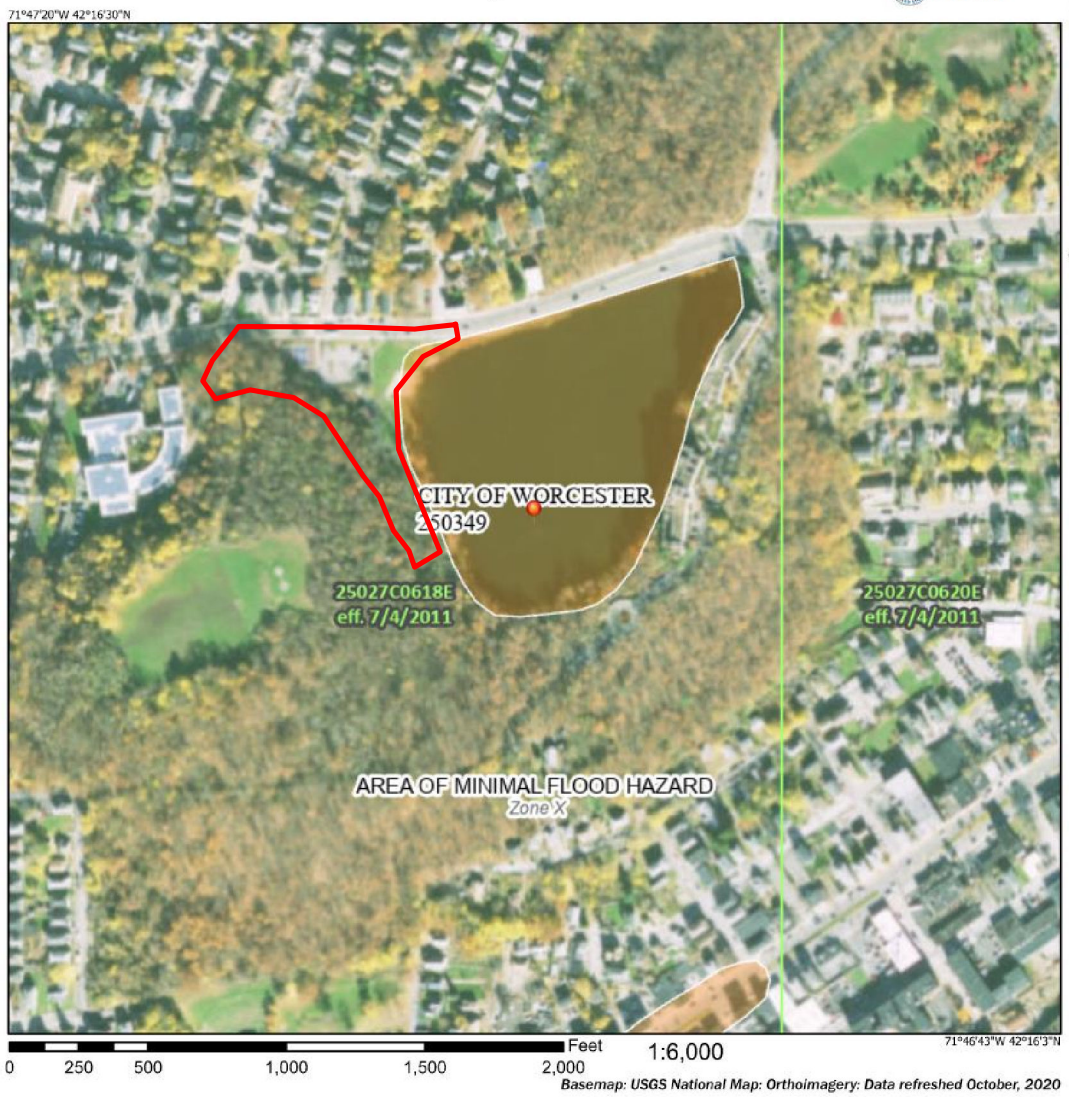
FIGURE 2

Bell Pond
Worcester, MA

USGS Map

Weston & Sampson

National Flood Hazard Layer FIRMette



FEMA

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

- SPECIAL FLOOD HAZARD AREAS
  - Without Base Flood Elevation (BFE) Zone A, V, A99
  - With BFE or Depth Zone AE, AO, AH, VE, AR
  - Regulatory Floodway
- OTHER AREAS OF FLOOD HAZARD
  - 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
  - Future Conditions 1% Annual Chance Flood Hazard Zone X
  - Area with Reduced Flood Risk due to Levee. See Notes. Zone X
  - Area with Flood Risk due to Levee Zone D
- OTHER AREAS
  - NO SCREEN Area of Minimal Flood Hazard Zone X
  - Effective LOMRs
  - Area of Undetermined Flood Hazard Zone D
- GENERAL STRUCTURES
  - Channel, Culvert, or Storm Sewer
  - Levee, Dike, or Floodwall
- OTHER FEATURES
  - 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
  - Coastal Transect
  - Base Flood Elevation Line (BFE)
  - Limit of Study
  - Jurisdiction Boundary
  - Coastal Transect Baseline
  - Profile Baseline
  - Hydrographic Feature
- MAP PANELS
  - Digital Data Available
  - No Digital Data Available
  - Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/1/2022 at 5:17 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

N W E S

0 175 350 700 Feet

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

Work Area

FIGURE 3

Bell Pond
Worcester, MA

FEMA FIRM Map

Weston & Sampson

N
W E
S

0 50 100 200 Feet

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

- Bank
- BVW
- Work Area
- Hydrologic Connection
- Perennial Stream
- Intermittent Stream
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune

ACECs

- ACECs

NHESP Habitats

- NHESP Estimated Habitats of Rare Wildlife
- NHESP Priority Habitats of Rare Species
- NHESP Certified Vernal Pools
- NHESP Potential Vernal Pools
- Cold Water Fisheries

FIGURE 4

Bell Pond
Worcester, MA

Environmental
Constraints Map

Weston & Sampson

APPENDIX D

SECTION 01 12 16

SCOPE AND SEQUENCE OF WORK

PART 1 – GENERAL

1.01 WORK INCLUDED:

The City of Worcester DPW&P proposes several amenities to be renovated and to be added to Bell Pond. The main improvements to the park consist of the renovation of the basketball court, parking lot, and playground and the installation of poured-in-place retaining walls, concrete plazas and paths, shade shelter, lighting, security cameras. Elements include, but are not limited to:

1. Unit-block retaining walls
2. Poured-in-place retaining walls
3. Ornamental and chain-link fencing
4. Shade shelters
5. Basketball court
6. Sports Lighting
7. Playground equipment
8. Poured-in-place safety surfacing
9. Parking
10. Accessible walkways
11. Benches and other amenities
12. Beach replenishment
13. Pipe gates
14. Tree plantings

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 GENERAL:

A. The Contractor shall be responsible for scheduling its activities and the activities of any subcontractors involved, to meet the completion date, or milestones, established for the contract. Scheduling of the work shall be coordinated with the Owner and Engineer.

B. The Construction Sequence Requirements shall be used by the Contractor to form a complete schedule for the project, which shall be coordinated with the Owner and Engineer. Prior to performing any work at the site, the Contractor shall submit a detailed plan to the Engineer for review. The plan shall describe the proposed sequence, methods, and timing of the work.

3.02 CONSTRUCTION SEQUENCING REQUIREMENTS:

A. Access to the gravel drive up to Chandler Hill Park shall be maintained for use by the City during construction.

END OF SECTION

SECTION 01 14 19.16

DUST CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION:

This section of the specification covers the control of dust via calcium chloride and water, complete.

PART 2 - PRODUCTS

2.01 WATER:

A. Water shall not be brackish and shall be free from oil, acid, and injurious alkali or vegetable matter.

PART 3 - EXECUTION

3.01.1 APPLICATION:

B. Water may be sprinkler applied with equipment including a tank with gauge-equipped pressure pump and a nozzle-equipped spray bar.

C. Water shall be dispersed through the nozzle under a minimum pressure of 20 pounds per square inch, gauge pressure.

END OF SECTION

SECTION 01 57 19

ENVIRONMENTAL PROTECTION

PART 1 – GENERAL

1.01 DESCRIPTION:

A. The work covered by this section of the specifications consists of furnishing all labor, materials, tools, and equipment and performing all work required for the prevention of environmental pollution during and because of construction operations under this contract.

B. All work under this Contract shall be in accordance with the Conservation Commissions' Orders of Conditions as well as any conditional requirements applied, all of which are attached to Section 00 31 43, PERMITS.

C. Prior to commencement of work, the Contractor shall meet with the Owner and the Engineer to develop mutual understandings relative to compliance of the environmental protection program.

1.02 RELATED WORK:

A. Section 00 31 43, PERMITS

B. Section 01 14 19.16, DUST CONTROL

C. Section 01 33 23, SUBMITTALS

D. Section 31 00 00, EARTHWORK

E. Section 31 11 00, CLEARING AND GRUBBING

1.03 SUBMITTALS:

A. The Contractor shall submit details and literature fully describing environmental protection methods to be employed in carrying out construction activities within 100 feet of resource areas protected under the Wetlands Protection Act.

PART 2 – PRODUCTS

2.01 CATCH BASIN PROTECTION:

A. To trap sediment and to prevent sediment from clogging drainage systems, catch basin protection in the form of a siltation sack (Siltsack as manufactured by ACF Environmental, Inc. or approved equal) shall be provided as approved by the Engineer.

PART 3- EXECUTION

3.01 NOTIFICATION AND STOPPAGE OF WORK:

A. The Engineer will notify the Contractor in writing of any non-compliance with the provisions of the Order of Conditions. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails to act promptly, the Owner may order stoppage of all or part of the work through the Engineer until satisfactory corrective action has been taken. No claim for an extension of time or for excess costs or damage incurred by the Contractor as a result of time lost due to any stop work orders shall be made unless it was later determined that the Contractor was in compliance.

3.02 AREA OF CONSTRUCTION ACTIVITY:

A. Insofar as possible, the Contractor shall confine his construction activities to those areas defined by the plans and specifications. All land resources within the project boundaries and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition after completion of construction at least equal to that which existed prior to work under this contract.

3.03 PROTECTION OF WATER RESOURCES:

A. The Contractor shall not pollute streams, lakes or reservoirs with fuels, oils, bitumens, calcium chloride, acids or other harmful materials. It is the Contractor's responsibility to comply with all applicable Federal, State, County and Municipal laws regarding pollution of rivers and streams.

B. Special measures should be taken to insure against spillage of any pollutants into public waters.

3.04 CONSTRUCTION IN RESOURCE AREAS PROTECTED UNDER THE WETLANDS PROTECTION ACT;

A. Insofar as possible, the Contractor shall make every effort to minimize disturbance within 100-feet of resource areas protected under the Wetlands Protection Act.

B. The Contractor shall perform his work in such a way that these areas outside the limits of work are left in the condition existing prior to construction.

C. The elevations of resource areas protected under the Wetlands Protection Act shall not be unduly disturbed by the Contractor’s operations.

3.05 PROTECTING AND MINIMIZING EXPOSED AREAS:

A. The Contractor shall limit the area of land which is exposed and free from vegetation during construction. In areas where the period of exposure will be greater than two (2) months, temporary vegetation, mulching or other protective measures shall be provided as specified.

B. The Contractor shall take account of the conditions of the soil where temporary cover crop will be used to ensure that materials used for temporary vegetation are adaptive to the sediment control. Materials to be used for temporary vegetation shall be approved by the Engineer.

3.06 LOCATION OF STORAGE AREAS:

A. The location of the Contractor's storage areas for equipment and/or materials shall be upon cleared portions of the job site or areas to be cleared as a part of this project and shall require written approval of the Engineer. Plans showing storage facilities for equipment and materials shall be submitted for approval of the Engineer.

B. No excavated materials or materials used in backfill operations shall be deposited within a minimum distance of one hundred (100) feet of any watercourse or any drainage facility. Adequate measures for erosion and sediment control such as the placement of compost filter tubes or silt fences around the perimeter of stockpiles shall be employed to protect any downstream areas from siltation.

C. There shall be no storage of equipment or materials in resource areas protected under the Wetlands Protection Act.

D. The Engineer may designate a particular area or areas where the Contractor may store materials used in his operations.

3.07 PROTECTION OF LANDSCAPE:

A. The Contractor shall not deface, injure, or destroy trees or shrubs nor remove or cut them without written authority from the Owner. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorages unless specifically authorized by the Engineer. Excavating machinery and cranes shall be of suitable type and be operated with care to prevent injury to trees which are not to be removed, particularly overhanging branches and limbs. The Contractor shall, in any event, be responsible for any damage resulting from such use.

B. Branches, limbs, and roots shall not be cut except by permission of the Engineer. All cutting shall be smoothly and neatly done without splitting or crushing. When there is unavoidable injury to branches, limbs and trunks of trees, the injured portions shall be neatly trimmed and covered with an application of grafting wax or tree healing paint as directed.

C. Where, in the opinion of the Engineer, trees may possibly be defaced, bruised, injured,

or otherwise damaged by the Contractor's equipment or by his blasting or other operations, the Engineer may require the Contractor to adequately protect such trees by placing boards, planks, poles or fencing around them. Any trees or landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the expense of the Contractor. The Engineer will decide what method of restoration shall be used, and whether damaged trees shall be treated and healed or removed and disposed of under the provisions of Section 31 11 00, CLEARING AND GRUBBING.

D. Cultivated hedges, shrubs, and plants which could be injured by the Contractor's operations shall be protected by suitable means or shall be dug up, balled and temporarily replanted and maintained. After construction operations have been substantially completed, they shall be replanted in their original positions and cared for until growth is re-established. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced by items of a kind and quality at least equal to that existing at the start of the work.

3.08 CLEARING AND GRUBBING:

A. The Contractor shall clear and grub only on the area designated on the contract drawings and only the area required for construction operations, as approved by the Engineer.

3.09 DUST CONTROL:

A. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and sprinkling of streets as necessary, to minimize creation and dispersion of dust.

3.10 CATCH BASIN PROTECTION:

A. Catch basin protection shall be used for every catch basin, shown on the plans or as required by the Engineer, to trap sediment and prevent it from clogging drainage systems. Siltation sacks shall be securely installed under the catch basin grate. Care shall be taken to keep the siltation sacks from breaking apart or clogging. All deposited sediment shall be removed periodically and at times prior to predicted precipitation to allow free drainage flow. Prior to working in areas where catch basins are to be protected, each catch basin sump shall be cleaned of all debris and protected. The contractor shall properly dispose of all debris at no additional cost to the Owner.

3.11 COMPOST FILTER TUBES:

A. The silt socks will be staked in the ground using wooden stakes driven at 4-foot intervals. The wooden stakes will be placed at a minimum depth of 24-inches into the ground.

B. The Contractor must have on site at all times 200’ linear feet of compost filter sock for use in the prompt replacement of any sections of installed compost filter sock that have broken apart or clogged.

END OF SECTION

SECTION 01 74 13

CLEANING UP

PART 1 - GENERAL

1.01 DESCRIPTION:

The Contractor must employ at all times during the progress of its work adequate cleanup measures and safety precautions to prevent injuries to persons or damage to property. The Contractor shall immediately, upon request by the Engineer provide adequate material, equipment and labor to cleanup and make safe any and all areas deemed necessary by the Engineer.

1.02 RELATED WORK:

A. Section 00 72 00 GENERAL CONDITIONS

B. Section 01 11 00 CONTROL OF WORK AND MATERIALS

C. Section 01 14 00 SPECIAL PROVISIONS

D. Section 01 57 19 ENVIRONMENTAL PROTECTION

PART 2 - PRODUCTS

Not applicable

PART 3 - EXECUTION

3.01 DAILY CLEANUP:

A. The Contractor shall clean up, at least daily, all refuse, rubbish, scrap and surplus material, debris and unneeded construction equipment resulting from the construction operations and

sweep the area. The site of the work and the adjacent areas affected thereby shall at all times present a neat, orderly and workmanlike appearance.

B. Upon written notification by the Engineer, the Contractor shall within 24 hours clean up those areas, which in the Engineer's opinion are in violation of this section and the above referenced sections of the specifications.

C. If in the opinion of the Engineer, the referenced areas are not satisfactorily cleaned up, all other work on the project shall stop until the cleanup is satisfactory.

3.02 MATERIAL OR DEBRIS IN DRAINAGE FACILITIES:

A. Where material or debris has washed or flowed into or has been placed in existing watercourses, ditches, gutters, drains, pipes, structures, such material or debris shall be entirely removed and satisfactorily disposed of during progress of the work, and the ditches, channels, drains, pipes, structures, and work shall, upon completion of the work, be left in a clean and neat condition.

3.03 REMOVAL OF TEMPORARY BUILDINGS, STRUCTURES AND EQUIPMENT:

A. On or before completion of the work, the Contractor shall, unless otherwise specifically required or permitted in writing, tear down and remove all temporary buildings and structures it built; shall remove all temporary works, tools and machinery or other construction equipment it furnished; shall remove all rubbish from any grounds which it has occupied; shall remove silt fences and hay bales used for trapping sediment; and shall leave the roads and all parts of the property and adjacent property affected by its operations in a neat and satisfactory condition.

3.04 RESTORATION OF DAMAGED PROPERTY:

A. The Contractor shall restore or replace, when and as required, any property damaged by its work, equipment or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end the Contractor shall do as required all necessary highway or driveway, walk and landscaping work. Materials, equipment, and methods for such restoration shall be as approved by the Engineer.

3.05 FINAL CLEANUP:

A. Before acceptance by the Owner, the Contractor shall perform a final cleanup to bring the construction site to its original or specified condition. This cleanup shall include removing all trash and debris off of the premises. Before acceptance, the Engineer shall approve the condition of the site.

B. Before acceptance by the Owner, the Contractor shall perform a final cleanup to bring the building to a "like new" condition. This cleanup shall include removing all trash and debris

from the premises; sweeping and mopping of all floors; washing of all walls, windows and doors; cleaning and polishing of all finish metal surfaces; cleaning of all equipment, utilizing proper solvents for removal of oil and grease; cleaning of dirt and debris out of all mechanical and electrical cabinets; and all other related work required to render the building suitable for use. Before acceptance, the Engineer shall approve the condition of the building.

END OF SECTION

Document7

APPENDIX E

AFFIDAVIT OF SERVICE

Under the Massachusetts Wetlands Protection Act

I, **Megan Kearns**, hereby certify under the Pains and Penalties of Perjury that on **March 22, 2023** I gave notification to abutters in compliance with the second paragraph of Massachusetts General Laws, Chapter 131, Section 40, and the DEP Guide to Abutter Notification dated, April 8, 1994, in connection with the following matter:

> A Notice of Intent has been filed under the Massachusetts Wetlands Protection Act by the **City of Worcester** with the **Worcester** Conservation Commission on **March 22, 2023** for property located at **190 and 238 Belmont Street (Bell Hill Park) in Worcester, Massachusetts**.

The completed notification and a list of the abutters to whom it was given and their addresses are attached to this Affidavit of Service.

3/22/23

Name**: Megan Kearns** **DATE**
Title**: Environmental Scientist**
Organization**: Weston & Sampson Engineers, Inc**

Notification to Abutters Under the Massachusetts Wetlands Protection Act

In accordance with the second paragraph of Massachusetts General Laws Chapter 131, Section 40, you are hereby notified of the following:

A. The name of the applicant is: **City of Worcester, Department of Public Works**
20 East Worcester Street
Worcester, MA 01604

B. The name of the owner is: **same as above**

C. The applicant has filed a **Notice of Intent** with the **Worcester Conservation Commission** seeking permission to alter an Area Subject to Protection under the Wetlands Protection Act (General Laws Chapter 131, Section 40). **The work includes improvements to the Bell Hill Park recreational area.**

D. The address of the lot(s) where the activity is proposed: **190 and 238 Belmont Street, Worcester MA**

E. Copies of the Notice of Intent may be examined at **455 Main Street** between the hours of **9:00 AM** and **5:00 PM** on **Monday – Friday**. For more information call the Worcester Conservation Commission at **508-799-1400.**

F. A public hearing will be held on **Monday, April 10, 2023** at **5:30 PM** in person at Worcester City Hall, located at 455 Main Street or via remote participation via https://cow.webex.com/meet/conservationcommissionwebex or by calling 415-655-0001 (Access Code 160 973 4358) for the Conservation Commission.

G. Additional information regarding the project, date, time and place of the public hearing may be obtained from Weston & Sampson Engineers, by contacting Megan Kearns at **978-548-6301** between the hours of **9:00 – 5:00** on the following days of the week: **Monday – Friday**. This application may be viewed 8:30am-2:00pm at the Division of Planning & Regulatory Services, city Hall, 455 Main Street, Room 404, Worcester, MA. Contact phone number – 508-799-1400 x31440.

NOTE: Notice of the public hearing, including its date, time and place will be published at least 7 calendar days prior to the hearing in the Worcester Telegram & Gazette.

NOTE: Agenda for the public hearing, including tis date, time, and place, will be posted on the City website (http://www.worcesterma.gov/city-clerk/agendas-minutes/boards-commissions) not less than 48 hours prior to the hearing.

NOTE: You also may contact your local Conservation Commission or the Department of Environmental Protection Regional Office for more information about this application or the Wetlands Protection Act.

CITY OF WORCESTER, MASSACHUSETTS

Eric D. Batista
Acting City Manager

Samuel Konieczny, MAA
City Assessor

Administration and Finance
Division of Assessing

REQUEST FOR MAPS AND/OR ABUTTERS' LISTS:

Please be advised that requested lists will typically be completed within ten (10) business days. Lists will be provided for a fee of $20.00 paid at the time of request. Please state the reason for the abutters' list and indicate if the subject parcel has shared ownership with an adjoining parcel, this will ensure the provided list meets the appropriate regulations. Two sets of mailing labels will be included when required.

Our email address is: Assessing@worcesterma.gov and our fax number is (508) 799-1021.

Please contact our office with any questions.

✓ ABUTTER'S LIST LABELS ✓ Yes No 1 SET ✓ 2 SETS

_____ MAP(S)

PROPERTY ADDRESS 190 and 238 Belmont Street
Worcester, MA

MBL No. _____

REASON:

_____ PLANNING
_____ ZONING
_____ LIQUOR LICENSE
✓ CONSERVATION COMMISSION
_____ HISTORICAL COMMISSION
_____ OTHER-_____

Footage for radius 100 feet

CONTACT:

NAME: Megan Kearns
ADDRESS: 55 Walkers Brook Drive, Suit
TELEPHONE: 978-548-6301

The City of WORCESTER

Assessing Division
Samuel E. Konieczny, MAA, City Assessor
City Hall, 455 Main Street, Worcester, MA 01608
P | 508-799-1098 F | 508-799-1021
assessing@worcesterma.gov

Certified Abutters List

A list of 'parties in interest' shall be attached to the application form and shall include the names and addresses. All such names and addresses shall be obtained from the most recent applicable tax list maintained by the City's Assessing Department. The Assessing Department certifies the list of names and addresses.

Total Count: 35

Parcel Address: 190 & 238 BELMONT ST
Assessor's Map-Block-Lot(s): 16-015-0009A & 16-036-00004

Owner: CITY OF WORCESTER PARKS DEPT

Owner Mailing: 455 MAIN ST
WORCESTER, MA 01608

Petitioner (if other than owner): MEGAN KEARNS
Petitioner Mailing Address: 55 WALKERS BRROK DR

Petitioner Phone: 978-548-6301

Planning:		Zoning:		Liquor License:		Conservation Commission:	X
Historical:		Cannabis:		Other:			

16-012-21+22	GURNEY CHARLES N III + MICHELLE	0103 GAGE ST	WORCESTER MA 01605
16-011-07+08	ASIEDU ROSINA	0073 MERRIFIELD ST	WORCESTER MA 01605
16-009-50+51	QUERCIO LINDA A + MICHAEL J SR(LIFE	0217 BELMONT ST	WORCESTER MA 01605
16-INX-0000A	CITY OF WORCESTER SCHOOL DEPT	20 IRVING ST	WORCESTER MA 01609
16-008-00037	KNEELAND CHRISTOPHER P	0191 BELMONT ST	WORCESTER MA 01605
16-008-00038	NGUYEN YEN	0193 BELMONT ST	WORCESTER MA 01605
16-036-00003	SEABURY RHF LIMITED PARTNERSHIP	536 GRANITE ST STE 301	BRAINTREE MA 02184
16-036-00004	CITY OF WORCESTER BELL POND	455 MAIN ST PARKS DEPT	WORCESTER MA 01608
16-009-031-3	FROWEIN SHANE	0005 OLGA AVE	WORCESTER MA 01605

16-009-00048	COX JEROME W + MARY V	0017 GARFIELD RD	WESTBOROUGH MA 01581
16-009-031-5	ANGER JENNIFER S	0150 SLATER ST	BLUFFTON SC 29909
16-015-0009A	CITY OF WORCESTER PARKS DEPT	455 MAIN STRET	WORCESTER MA 01608
16-011-00018	JOLLY CHIMP LLC	0314 OAKRIDGE RD	DEERFIELD BEACH FL 33442
16-011-00002	RANO CAROL L TRUSTEE	85 MERRIFIELD ST	WORCESTER MA 01605
16-011-00012	WANDA OSSENI N	59-61 MERRIFIELD ST	WORCESTER MA 01605
16-011-00015	WATSON RAYMOND W + GLORIA	0055 MERRIFIELD ST	WORCESTER MA 01605
16-011-00016	HOLAVANALLI SHASHANK RAJ +	0007 ALAN R GERRISH DR	WOBURN MA 01801
16-017-0006A	DIONNE MARY A	0100 ELLIOT ST	WORCESTER MA 01605
16-015-0009B	CITY OF WORCESTER PARKS DEPT	455 MAIN ST	WORCESTER MA 01608
16-017-00010	CITY OF WORCESTER PARKS DEPT	455 MAIN ST ROOM 203	WORCESTER MA 01608
16-012-00002	ASOMAMING GENIVIEVE +	0020 MERRIFIELD ST	WORCESTER MA 01605
16-009-00028	COX REAL ESTATE LLC	0069 EAST MAIN ST	WESTBOROUGH MA 01581
16-009-00029	MBOKAR AMOS + ABRAHAM	0201 BELMONT ST	WORCESTER MA 01605
16-009-00030	MCEVOY CIARAN	0038 HARDWICK ST	BRIGHTON MA 02135
16-008-00039	ELISSETCHE JUAN S LIFE EST+	0087 HOLDEN ST	WORCESTER MA 01608
16-008-00040	DARDY ENTERPRISES LLC	0060 MARLBORO ST	WORCESTER MA 01604
16-007-00044	BINETTE ROBERT H +	8 BLUEGRASS LN	SHREWSBURY MA 01545
16-008-00013	MENESES ARNOLD A	0003 EVERARD ST	WORCESTER MA 01605
16-009-031-4	VESPA PHILLIP	0003 OLGA AVE	WORCESTER MA 01605
16-011-00005	77 MERRIFIELD LLC	0055 LINDEN ST	WORCESTER MA 01609
16-011-00004	RGI PROPERTIES LLC	0040 LAKE SHORE DR	SOUTH WESTFORD MA 01886
16-011-00010	ED'S HVAC CORP	1011 CONCORD RD	MARLBOURGH MA 01752
16-012-00020	40 MERRIFIELD STREET LLC	0014 KETTLE HOLD RD	BOLTON MA 01740
16-009-00049	QUERCIO LINDA A + MICHAEL J SR(LIFE	0217 BELMONT ST	WORCESTER MA 01605
57-003-00003	CITY OF WORCESTER PARKS DEPT	455 MAIN ST PARKS DEPT	WORCESTER MA 01608

This is to certify that the above is a list of abutters to Assessor's Map-Block-Lot`s 16-015-0009A & 16-036-00004 as cited above.

Certified by:

Signature

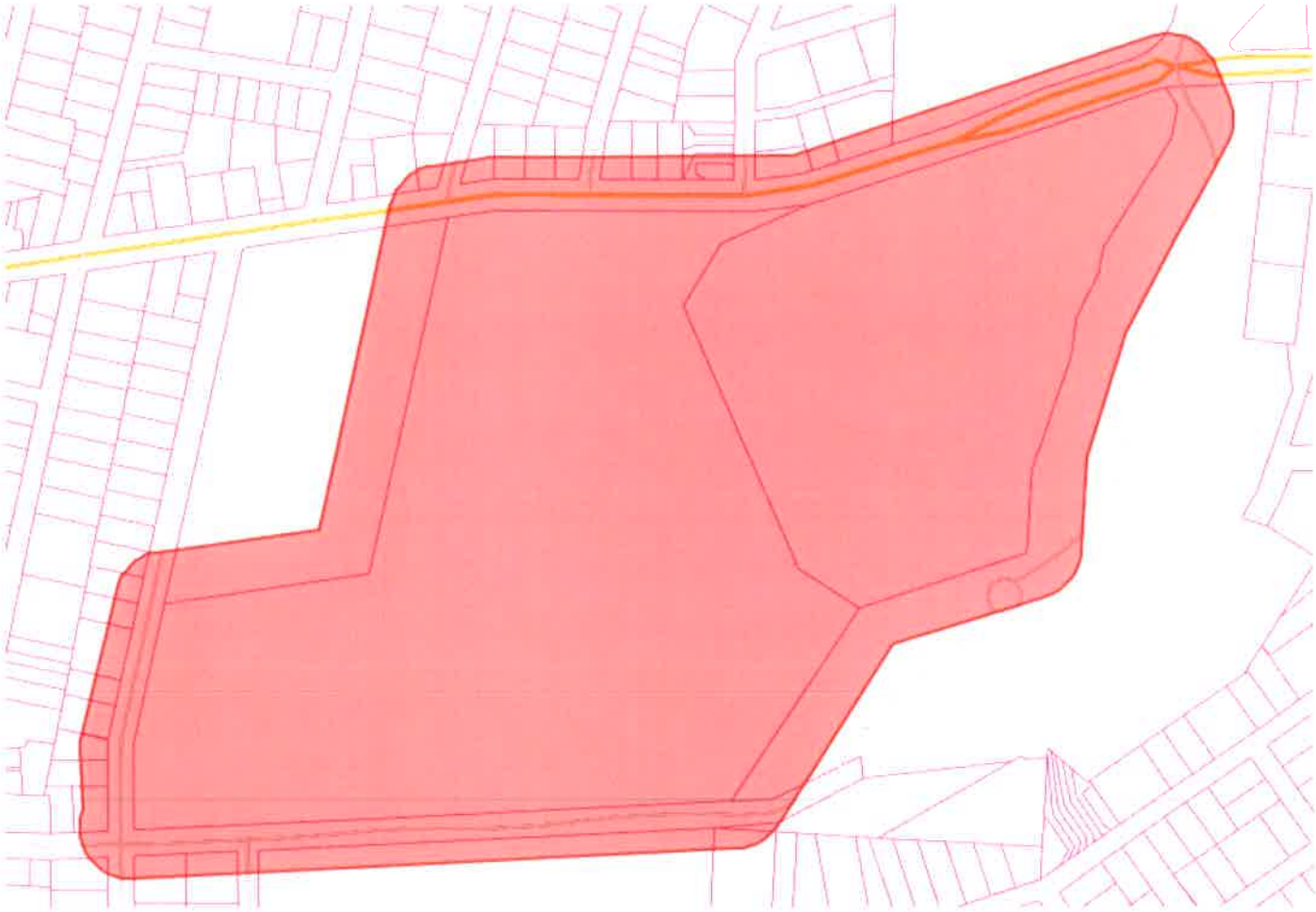
3/13/2023

Date

The City of WORCESTER

Assessing Division
Samuel E. Konieczny, MAA, City Assessor
City Hall, 455 Main Street, Worcester, MA 01608
P | 508-799-1098 **F** | 508-799-1021
assessing@worcesterma.gov

Abutters Map



GURNEY CHARLES N III + MICHELLE
0103 GAGE ST
WORCESTER MA 01605

ANGER JENNIFER S
0150 SLATER ST
BLUFFTON SC 29909

ASOMAMING GENIVIEVE +
0020 MERRIFIELD ST
WORCESTER MA 01605

ASIEDU ROSINA
0073 MERRIFIELD ST
WORCESTER MA 01605

CITY OF WORCESTER PARKS DEPT
455 MAIN STRET
WORCESTER MA 01608

COX REAL ESTATE LLC
0069 EAST MAIN ST
WESTBOROUGH MA 01581

QUERCIO LINDA A + MICHAEL J SR(LIFE
0217 BELMONT ST
WORCESTER MA 01605

JOLLY CHIMP LLC
0314 OAKRIDGE RD
DEERFIELD BEACH FL 33442

MBOKAR AMOS + ABRAHAM
0201 BELMONT ST
WORCESTER MA 01605

CITY OF WORCESTER SCHOOL DEPT
20 IRVING ST
WORCESTER MA 01609

RANO CAROL L TRUSTEE
85 MERRIFIELD ST
WORCESTER MA 01605

MCEVOY CIARAN
0038 HARDWICK ST
BRIGHTON MA 02135

KNEELAND CHRISTOPHER P
0191 BELMONT ST
WORCESTER MA 01605

WANDA OSSENI N
59-61 MERRIFIELD ST
WORCESTER MA 01605

ELISSETCHE JUAN S LIFE EST+
0087 HOLDEN ST
WORCESTER MA 01608

NGUYEN YEN
0193 BELMONT ST
WORCESTER MA 01605

WATSON RAYMOND W + GLORIA
0055 MERRIFIELD ST
WORCESTER MA 01605

DARDY ENTERPRISES LLC
0060 MARLBORO ST
WORCESTER MA 01604

SEABURY RHF LIMITED PARTNERSHIP
536 GRANITE ST STE 301
C/O FEDERAL MANAGEMENT
BRAINTREE MA 02184

HOLAVANALLI SHASHANK RAJ +
0007 ALAN R GERRISH DR
WOBURN MA 01801

BINETTE ROBERT H +
8 BLUEGRASS LN
SHREWSBURY MA 01545

CITY OF WORCESTER BELL POND
455 MAIN ST PARKS DEPT
WORCESTER MA 01608

DIONNE MARY A
0100 ELLIOT ST
WORCESTER MA 01605

MENESES ARNOLD A
0003 EVERARD ST
WORCESTER MA 01605

FROWEIN SHANE
0005 OLGA AVE
WORCESTER MA 01605

CITY OF WORCESTER PARKS DEPT
455 MAIN ST
WORCESTER MA 01608

VESPA PHILLIP
0003 OLGA AVE
WORCESTER MA 01605

COX JEROME W + MARY V
0017 GARFIELD RD
WESTBOROUGH MA 01581

CITY OF WORCESTER PARKS DEPT
455 MAIN ST ROOM 203
WORCESTER MA 01608

77 MERRIFIELD LLC
C/O SUSTAINABLE COMFORT INC
0055 LINDEN ST
WORCESTER MA 01609

RGI PROPERTIES LLC
0040 LAKE SHORE DR
SOUTH WESTFORD MA 01886

ED'S HVAC CORP
1011 CONCORD RD
MARLBOURGH MA 01752

40 MERRIFIELD STREET LLC
0014 KETTLE HOLD RD
BOLTON MA 01740

QUERCIO LINDA A + MICHAEL J SR(LIFE
0217 BELMONT ST
WORCESTER MA 01605

CITY OF WORCESTER PARKS DEPT
455 MAIN ST PARKS DEPT
WORCESTER MA 01608

GURNEY CHARLES N III + MICHELLE
0103 GAGE ST
WORCESTER MA 01605

ANGER JENNIFER S
0150 SLATER ST
BLUFFTON SC 29909

ASOMAMING GENIVIEVE +
0020 MERRIFIELD ST
WORCESTER MA 01605

ASIEDU ROSINA
0073 MERRIFIELD ST
WORCESTER MA 01605

CITY OF WORCESTER PARKS DEPT
455 MAIN STRET
WORCESTER MA 01608

COX REAL ESTATE LLC
0069 EAST MAIN ST
WESTBOROUGH MA 01581

QUERCIO LINDA A + MICHAEL J SR(LIFE
0217 BELMONT ST
WORCESTER MA 01605

JOLLY CHIMP LLC
0314 OAKRIDGE RD
DEERFIELD BEACH FL 33442

MBOKAR AMOS + ABRAHAM
0201 BELMONT ST
WORCESTER MA 01605

CITY OF WORCESTER SCHOOL DEPT
20 IRVING ST
WORCESTER MA 01609

RANO CAROL L TRUSTEE
85 MERRIFIELD ST
WORCESTER MA 01605

MCEVOY CIARAN
0038 HARDWICK ST
BRIGHTON MA 02135

KNEELAND CHRISTOPHER P
0191 BELMONT ST
WORCESTER MA 01605

WANDA OSSENI N
59-61 MERRIFIELD ST
WORCESTER MA 01605

ELISSETCHE JUAN S LIFE EST+
0087 HOLDEN ST
WORCESTER MA 01608

NGUYEN YEN
0193 BELMONT ST
WORCESTER MA 01605

WATSON RAYMOND W + GLORIA
0055 MERRIFIELD ST
WORCESTER MA 01605

DARDY ENTERPRISES LLC
0060 MARLBORO ST
WORCESTER MA 01604

SEABURY RHF LIMITED PARTNERSHIP
536 GRANITE ST STE 301
C/O FEDERAL MANAGEMENT
BRAINTREE MA 02184

HOLAVANALLI SHASHANK RAJ +
0007 ALAN R GERRISH DR
WOBURN MA 01801

BINETTE ROBERT H +
8 BLUEGRASS LN
SHREWSBURY MA 01545

CITY OF WORCESTER BELL POND
455 MAIN ST PARKS DEPT
WORCESTER MA 01608

DIONNE MARY A
0100 ELLIOT ST
WORCESTER MA 01605

MENESES ARNOLD A
0003 EVERARD ST
WORCESTER MA 01605

FROWEIN SHANE
0005 OLGA AVE
WORCESTER MA 01605

CITY OF WORCESTER PARKS DEPT
455 MAIN ST
WORCESTER MA 01608

VESPA PHILLIP
0003 OLGA AVE
WORCESTER MA 01605

COX JEROME W + MARY V
0017 GARFIELD RD
WESTBOROUGH MA 01581

CITY OF WORCESTER PARKS DEPT
455 MAIN ST ROOM 203
WORCESTER MA 01608

77 MERRIFIELD LLC
C/O SUSTAINABLE COMFORT INC
0055 LINDEN ST
WORCESTER MA 01609

RGI PROPERTIES LLC
0040 LAKE SHORE DR
SOUTH WESTFORD MA 01886

ED'S HVAC CORP
1011 CONCORD RD
MARLBOURGH MA 01752

40 MERRIFIELD STREET LLC
0014 KETTLE HOLD RD
BOLTON MA 01740

QUERCIO LINDA A + MICHAEL J SR(LIFE
0217 BELMONT ST
WORCESTER MA 01605

CITY OF WORCESTER PARKS DEPT
455 MAIN ST PARKS DEPT
WORCESTER MA 01608

APPENDIX F

Weston & Sampson SM

westonandsampson.com

55 Walkers Brook Drive, Suite 100
Reading, MA 01867
tel: 978.532.1900

Wetland Delineation Report

August 2022

Bell Pond

Worcester, Massachusetts

Wetland Delineation Conducted By:
Megan Kearns, PWS on 8/19/2022

Delineation Report Reviewed By:
Mel Higgins, PWS

TABLE OF CONTENTS

Page

FIGURES

APPENDICES

1.0 SITE DESCRIPTION

On August 19, 2022, the presence of wetland resources was investigated near Bell Pond in Worcester, Massachusetts. This investigation area is located south of Belmont Street (Route 9) and is adjacent to Bell Hill Park, Chandler Hill Park, and Belmont Street Community School. Please see Figure 1 (Wetland Delineation Map) and Figure 2 (USGS Map) of this report for the investigation area.

Wetland resource areas including two bordering vegetated wetlands and inland bank, were identified and flagged in the field using pink flagging by a Weston & Sampson employee who is trained in the wetland delineation process using the Massachusetts Department of Environmental Protection (MassDEP) and the US Army Corps of Engineers methodology. Further descriptions of these wetland resource areas are presented in the following sections.

2.0 DELINEATION OF WETLAND RESOURCES

2.1 Site Observations

The Weston & Sampson wetland scientist, trained in the ACOE Wetland Delineation Manual and Massachusetts Department of Environmental Protection (MassDEP) Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetland Protection Act guidance document, observed the following protected wetland resources at the site:

- Bordering Vegetated Wetlands (BVW)
- Bank – Pond
- Land Under Water (LUW)

Field data were recorded on US Army Corps of Engineers (ACOE) Wetland Determination Data Forms. See Appendix A for completed data forms and Appendix B for site photographs.

2.2 Wetland Delineation Methodology

A wetland delineation assessment was conducted in accordance with the Massachusetts Wetland Protection Act Regulations (310 CMR 10.55(2)(c)), Massachusetts Department of Environmental Protection (MassDEP) Delineating Bordering Vegetated Wetlands Under the Massachusetts Protection Act (March 1995), and ACOE Wetland Manual (Technical Report Y-87-1).

The bordering vegetated wetlands (BVW) delineation methodology included the characterization of vegetation, soil and hydrologic conditions in both wetland and upland areas to identify the transitional area, which was used as the wetland limit. Pink flags with distinct flag numbers were left in the field to show wetland resource area limits.

Vegetation, hydrology and soils were assessed in both wetland and upland areas to accurately place the wetland limits at each site. The percentage of vegetative species was estimated by creating sample plots. Sample plot radius for trees, saplings, shrubs, groundcover and woody vine strata was 30', 15', 15', 5' and 30', respectively. After creating the sample plot areas, the percent basal area coverage of each species within the monitoring plot was recorded. Using these field observations, the percent dominance of each species within its stratum was calculated. The 50/20 Rule was then used to determine dominance. Dominant species were

considered the most abundant plant species (when ranked in descending order of abundance and cumulatively totaled) that immediately exceeds 50% of the total dominance measure (basal area) for the stratum, plus any additional species comprising 20% or more of the total dominance measure for the stratum. Once the dominant species were determined, they were treated equally to determine the presence of hydrophytic vegetation. If the number of dominant species with a Wetland Indicator Status of FAC (excluding FAC-), FACW or OBL is greater than, or equal to, the number of remaining dominant species, the area was considered a jurisdictional wetland resource area based on vegetation.

A soil sample from each wetland sample plot were also taken. Each soil sample goes to a depth of at least 12-24 inches. The soil was characterized to determine if the soil sample was considered a hydric (wetland) soil. Soil samples, including mottles, were characterized based on color using Munsell Soil-Color charts as a color reference.

The general area was then assessed for hydrologic conditions, including, but not limited to, site inundation, depth to free water, depth of soil saturation, water marks, drift lines, sediment deposits, water-stained leaves.

2.3 Bordering Vegetated Wetlands (BVW)

Two BVW series were delineated at the site. These BVWs are located adjacent to Bell Pond. The limit of the BVW resource areas were determined by locating the transitional area between wetland and upland vegetation, soils and hydrologic conditions. Wetland flags left in the field included:

- BVW-A1 through BVW-A6 (BVW “A” Series)
- BVW-B1 through BVW-B5 (BVW “B” Series)

Dominant vegetation within the wetland resource area included buttonbush (*Cephalanthus occidentalis*), purple loosestrife (*Lythrum salicaria*), cattail (*Typha latifolia*), phragmites (*Phragmites australis*), common rush (*Juncus effusus*), and green bulrush (*Scirpus atrovirens*). Soils within the BVW’s were composed of fine sandy loam with and redoximorphic features. Other indicators of wetland hydrology included surface water, highwater table and saturation.

Upland vegetation included a landscaped and manicured grass lawn in the Bell Hill Park. Soils within the upland were composed of fine sandy loam with no evidence of mottling or hydrology within the top 12 inches.

BVWs are subject to a 100-foot buffer under the Massachusetts Wetland Protection Act per 310 CMR 10.02(2)(b) and the Worcester Wetland Protection Ordinance and Regulations

2.4 Bank

Water bodies, including perennial streams, intermittent streams, ponds and lakes, have banks which are protected by the Massachusetts Wetland Protection Act. Bank is a wetland resource area defined by 310 CMR 10.54(2)(a) as "the potion of land surface which normally abuts and confines a water body. It occurs between a waterbody and a vegetated bordering wetland and adjacent floodplain, or, in absence of these, it occurs between a waterbody and an upland." Vegetated banks provide valuable functions such as flood control, stormwater prevention, fisheries protection, and water quality protection. The limit of this resource area is identified by Top of Bank (TOB) which is located at the first observable break in slope or the Mean Annual Flood Level (MAFL), whichever is lower. TOB is easily identified in the field so that indicator was utilized for this wetland delineation.

Pond Bank

Bell Pond is located south of Belmont Street (Route 9) at Bell Hill Park. The waterbody is approximately 11 acres in size. According to the Massachusetts Wetland Protection Act a pond is defined as "any body of fresh water with a surface area observed or recorded within the last ten years of at least 10,000 square feet". According to the Massachusetts Wetland Protection Act "ponds may be either naturally occurring or human made by impoundment, excavation or otherwise". Wetland flags left in the field included:

- TOB-B1 through TOB-B30 (Pond Bank "B" Series)

In addition to field flags, after discussions with the Conservation Commission agent, the top of the dam spillway will be used as the Top of Bank. The top of the spillway is at elevation 665.8 NAVD88. Pond banks are subject to a 100-foot buffer under the Massachusetts Wetland Protection Act per 310 CMR 10.02(2)(b).

2.5 Land Under Water (LUW)

Land Under Waterbodies is a wetland resource area defined by 310 CMR 10.55(2)(a) as "the land beneath any creek, river, stream, pond or lake." The limit of this resource area is identified by the "mean annual low water level". Land Under Water was not field delineated.

2.6 Other Protected Areas

Weston & Sampson created environmental resources maps (see Figure 4) of the site to determine the presence of other protected areas. The data source of these map layers was the Massachusetts Geographic Information System (MassGIS). These areas included:

- NHESP Priority Habitats of Rare Species
- NHESP Estimated Habitats of Rare Wildlife
- NHESP Certified and Potential Vernal Pools
- Areas of Critical Environmental Concern (ACEC)
- Outstanding Resource Waters (ORW)
- Coldwater Fisheries

Wetland resources identified in the field were also added to these maps. Based on the MassGIS information there are no protected areas other than the Pond and BVW wetland resource area previously identified above. Six Potential Vernal Pools were identified north of the investigation area across Belmont Street (Route 9). No Potential or Certified Vernal Pools were identified in the investigation area.

FEMA Flood Insurance Rate Maps (FIRM) were created online from the FEMA website to determine if there is a 100-year flood zone at the site. See Figure 3 for FIRM map. Based on FEMA flood maps the investigation area is not located within the 100-year flood zone (Community Panel No. 25027C0618E dated 7/4/2011). Bell Pond is mapped as a 0.2% annual chance flood hazard area, which is areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile (Zone X).

The Massachusetts Wetland Protection Act does not place a buffer zone on the 100-year flood zone (Bordering Land Subject to Flooding).

3.0 SUMMARY

On August 19, 2022, the presence of wetland resources was investigated near Bell Pond in Worcester, Massachusetts. Two BVWs and Bank were identified and flagged at the site.

Additional environmental mapping was conducted using MassGIS data layers and FEMA FIRM mapping. This additional mapping indicates that no mapped NHESP habitats, ACECs, ORWs, 100-year flood zone, or Vernal Pools were identified in the investigation area.

This Wetlands Delineation Report has been reviewed and approved by a Professional Wetland Scientist PWS.

4.0 REFERENCES

Jackson, Scott. 1995. "Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act." Massachusetts Department of Environmental Protection.

Massachusetts Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program. Massachusetts Natural Heritage Atlas, 13th Edition with 2017 web updates. Accessed on 9/2/2022.

Massachusetts Geographic Information System. January 2009. Outstanding Resource Waters. Massachusetts Department of Environmental Protection. Accessed on 9/2/2022.

Massachusetts Geographic Information System. December 2003. Areas of Critical Environmental Concern. Massachusetts Department of Environmental Protection. Accessed on 9/2/2022.

Newcomb, Lawrence. 1977. Newcomb's Wildflower Guide. Little, Brown and Company.

Web Soil Survey of Worcester County, Massachusetts. United States Department of Agriculture, Soil Conservation Service, in cooperation with Massachusetts Agricultural Experiment Station

United States Department of Agriculture, Natural Resources Conservation Service. *2018. Field Indicators of Hydric Soils in the United States, Version 8.2.* L. M. Vasilas, G. W. Hurt, and J.F. Berkowitz (eds.). USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils.

USACOE, January 1987, Corps of Engineers Wetlands Delineation Manual, Wetlands Research Program Technical Report Y-87-1.

FEMA Flood Map Service Center, online at msc.fema.gov/portal Assessed on 9/2/2022.
Tiner, Jr., Ralph W., 2005, Field Guide to Nontidal Wetland Identification

Tiner, Jr., Ralph W, 2009, Field Guide to Tidal Wetland Plants of the Northeastern United States and Neighboring Canada.

Wojtec, Michael, Bard – A field Guide to Trees of the Northeast.

New England Hydric Soils Technical Committee, 2019, Version 4, *Field Indicator of Identifying Hydric Soils in New England*. New England Interstate Water Pollution Control Commission, Lowell, MA.

APPENDIX A

ACOE Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Bell Pond City/County: Worcester Sampling Date: 8/19/22

Applicant/Owner: City of Worcester State: MA Sampling Point: BVWA1 WET

Investigator(s): Megan Kearns, PWS Section, Township, Range:

Landform (hillside, terrace, etc.): Local relief (concave, convex, none): Slope (%):

Subregion (LRR or MLRA): LRR R, MLRA 144A Lat: 42.272087 Long: -71.784895 Datum: WGS84

Soil Map Unit Name: Paxton fine sandy loam, 15 to 25 percent slopes NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area**
Hydric Soil Present?	Yes X	No ____	**within a Wetland?** **Yes** X **No** ____
Wetland Hydrology Present?	Yes X	No ____	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)
Drought has been recorded in Massachusetts.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes X	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: BVWA1 WET

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1. *Cephalanthus occidentalis*	20	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
	20 =Total Cover		
Herb Stratum (Plot size: 5)			
1. *Typha latifolia*	30	Yes	OBL
2. *Lythrum salicaria*	15	Yes	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	45 =Total Cover		
Woody Vine Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	65	x 1 =	65
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	65 (A)		65 (B)

Prevalence Index = B/A = 1.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVWA1 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 2/1	100					Sandy	sand
6-12	10YR 2/1	90	10YR 4/6	10	C	M	Sandy	sand

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ? Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: rock

Depth (inches): 12

Hydric Soil Present? **Yes** X **No** ___

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Bell Pond City/County: Worcester Sampling Date: 8/19/22

Applicant/Owner: City of Worcester State: MA Sampling Point: BVWA1 UP

Investigator(s): Megan Kearns, PWS Section, Township, Range:

Landform (hillside, terrace, etc.): Local relief (concave, convex, none): Slope (%):

Subregion (LRR or MLRA): LRR R, MLRA 144A Lat: 42.272087 Long: -71.784895 Datum: WGS84

Soil Map Unit Name: Paxton fine sandy loam, 15 to 25 percent slopes NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area**	
Hydric Soil Present?	Yes ____	No X	**within a Wetland?**	**Yes** ____ **No** ____
Wetland Hydrology Present?	Yes ____	No X	If yes, optional Wetland Site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)
Drought has been recorded in Massachusetts.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No ____	Depth (inches): ____
Water Table Present?	Yes ____	No ____	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No ____	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: BVWA1 UP

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *None - side of road/pavement*			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Herb Stratum (Plot size: 5)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	=Total Cover		
Woody Vine Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVWA1 UP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
								None - side of road/pavement

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ___ **No** X

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Bell Pond City/County: Worcester Sampling Date: 8/19/22

Applicant/Owner: City of Worcester State: MA Sampling Point: BVWB5 WET

Investigator(s): Megan Kearns, PWS Section, Township, Range:

Landform (hillside, terrace, etc.): Local relief (concave, convex, none): Slope (%):

Subregion (LRR or MLRA): LRR R, MLRA 144A Lat: 42.272087 Long: -71.784895 Datum: WGS84

Soil Map Unit Name: Paxton fine sandy loam, 15 to 25 percent slopes NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area**
Hydric Soil Present?	Yes X	No ____	**within a Wetland?** **Yes** X **No** ____
Wetland Hydrology Present?	Yes X	No ____	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)
Drought has been recorded in Massachusetts.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 0
Water Table Present?	Yes X	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: BVWB5 WET

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Catalpa speciosa*	10	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	10	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15)			
1. *Cephalanthus occidentalis*	30	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
	30	=Total Cover	
Herb Stratum (Plot size: 5)			
1. *Lythrum salicaria*	30	Yes	OBL
2. *Euthamia graminifolia*	30	Yes	FAC
3. *Eupatorium perfoliatum*	10	No	FACW
4. *Carex scoparia*	5	No	FACW
5. *Carex lurida*	5	No	OBL
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	80	=Total Cover	
Woody Vine Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	65	x 1 =	65
FACW species	15	x 2 =	30
FAC species	30	x 3 =	90
FACU species	10	x 4 =	40
UPL species	0	x 5 =	0
Column Totals:	120 (A)		225 (B)

Prevalence Index = B/A = 1.88

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVWB5 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 2/2	100					Sandy	sand
2-8	2.5Y 4/2	75	10YR 4/6	25	C	M	Sandy	sand
8-16	10YR 5/2	90	10YR 4/6	10	C	M	Sandy	sand

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to reflect the NRCS Field Indicators of Hydric Soils version 7.0 March 2013 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Bell Pond City/County: Worcester Sampling Date: 8/19/22

Applicant/Owner: City of Worcester State: MA Sampling Point: BVWB5 UP

Investigator(s): Megan Kearns, PWS Section, Township, Range:

Landform (hillside, terrace, etc.): Local relief (concave, convex, none): Slope (%):

Subregion (LRR or MLRA): LRR R, MLRA 144A Lat: 42.272087 Long: -71.784895 Datum: WGS84

Soil Map Unit Name: Paxton fine sandy loam, 15 to 25 percent slopes NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area**	
Hydric Soil Present?	Yes ____	No X	**within a Wetland?**	**Yes** ____ **No** ____
Wetland Hydrology Present?	Yes ____	No X	If yes, optional Wetland Site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)
Drought has been recorded in Massachusetts.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No ____	Depth (inches): ____
Water Table Present?	Yes ____	No ____	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No ____	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: BVWB5 UP

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *None - manicured lawn*			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Herb Stratum (Plot size: 5)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	=Total Cover		
Woody Vine Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVWB5 UP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 4/4	100					Sandy	sand

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: rock

Depth (inches): 12

Hydric Soil Present? **Yes** ___ **No** X

Remarks:

APPENDIX B

Site Photographs

Photo 1: View of Bell Pond facing southeast from the parking lot.

Photo 2: View of BVW Series A from flag BVW-A1.

Photo 3: View of the bank of Bell Pond and walking recreational pathway adjacent to the pond.

Photo 4: View of BVW series B.

APPENDIX G

Photo 1: View of Bell Pond facing southeast from the parking lot.

Photo 2: View of BVW Series A from flag BVW-A1.

Photo 3: View of the bank of Bell Pond and walking recreational pathway adjacent to the pond.

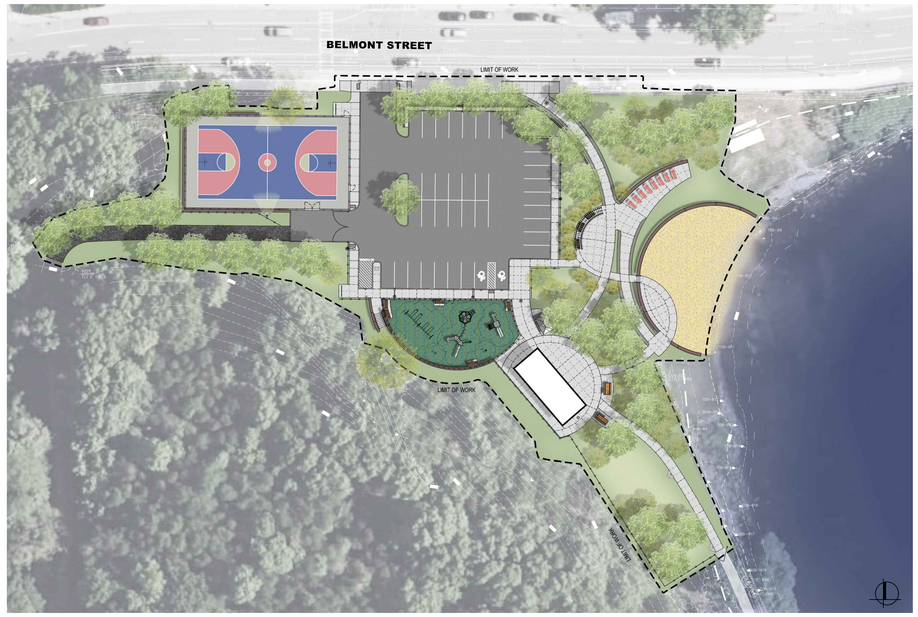
Photo 4: View of BVW series B.

APPENDIX H

CITY OF WORCESTER

BELL POND PARK IMPROVEMENTS

196 BELMONT STREET,
WORCESTER, MASSACHUSETTS 01605



FOR ILLUSTRATIVE PURPOSES ONLY

BELL POND PARK
Locus Map

PERMIT SET
-NOT FOR CONSTRUCTION-

SHEET INDEX

MARCH 22, 2023

Prepared By

Weston & Sampson SM

427 Main Street, Suite 400, Worcester, MA
(508) 698-3034 (800) Sampson
www.westonandsampson.com

GENERAL NOTES:

1. FIELD SURVEY PERFORMED BY NORTHEAST SURVEY CONSULTANTS, PC USING EDM TOTAL STATION AND RTK GPS IN OCTOBER & NOVEMBER 2022, WITH A SMALL ADDITIONAL PORTION IN THE NW CORNER IN JANUARY 2023.
2. THE HORIZONTAL DATUM IS NAD83 (MASS. MAINLAND) AND THE VERTICAL DATUM IS NAVD88. BOTH WERE DERIVED FROM RTK GPS OBSERVATIONS TAKEN ON SITE.
3. THIS IS NOT A BOUNDARY SURVEY. NO WORK TO DEFINE ANY BOUNDARY LINES HAS BEEN PERFORMED AND LINES SHOWN HEREON ARE BASED UPON GIS.
4. THE LOCATIONS OF UTILITIES SHOWN HEREON ARE THE RESULT OF SURFACE EVIDENCE AND OPENING STRUCTURES AS SHOWN. THIS PLAN DOES NOT NECESSARILY DEPICT THE EXACT LOCATION OF THESE UTILITIES AND MAY NOT SHOW ALL OF THE UTILITIES WHICH EXIST WITHIN THE PREMISES SURVEYED. CONTACT DIG-SAFE AT 1-888-344-7233 BEFORE EXCAVATION.
5. THE LOCUS PARCELS ARE LOCATED IN THE CITY OF WORCESTER RG-5 ZONING DISTRICT.
6. ACCORDING TO FEDERAL EMERGENCY MANAGEMENT AGENCY MAPS, THE SURVEY AREA IS LOCATED IN AREAS DESIGNATED AS ZONE S (AREAS OF MINIMAL FLOODING), ZONE X SHADED (AREAS OF 0.5% ANNUAL CHANCE FLOOD ETC.), COMMUNITY PANEL NO. 25027C 0618 E, EFFECTIVE DATE 7/4/2011.
7. WETLANDS SHOWN HEREON WERE DELINEATED BY WESTON & SAMPSON, INC. WETLAND FLAG SYMBOLS REPRESENT FLAGS FOUND & LOCATED BY THIS SURVEY, ALL OTHER WETLAND LINES ARE TAKEN FROM DIGITAL DATA PROVIDED BY WESTON & SAMPSON, INC.
8. TOP OF BANK DETERMINED TO BE THE SAME AS SPILLWAY ELEVATION (EL 665.8) PER WORCESTER CONSERVATION COMMISSION AGENT
9. ALL TEST PIT LOCATIONS SHOWN ARE APPROXIMATE AND BASED ON FIELD MEASUREMENTS RELATIVE TO EXISTING SITE FEATURES.
10. ALL TEST PITS WERE COMPLETED BY NEW ENGLAND BORING CONTRACTORS, INC. OF DERRY, NEW HAMPSHIRE AND OBSERVED BY WESTON & SAMPSON ENGINEERS ON AUGUST 19, 2022.
11. FOR DETAILED NOTES REGARDING TEST PITS AND BORINGS, REFER TO MEMO TITLED "GEOTECH LETTER REPORT" IN THE SPECIFICATIONS.
12. REFER TO GENERAL SYMBOLS FOR SURVEY LEGEND. ALL BIDDERS ARE REQUIRED TO INSPECT THE PROJECT SITE IN ITS ENTIRETY PRIOR TO SUBMITTING THEIR BID, AND BECOME FAMILIAR WITH ALL CONDITIONS AS THEY MAY AFFECT THEIR BID. CONTRACTOR AND SUB-CONTRACTOR SHALL BE FAMILIAR WITH ALL DRAWINGS AND SPECIFICATIONS PRIOR TO COMMENCING THE CONSTRUCTION.
13. LOCATIONS OF ANY UTILITIES SHOWN ON THESE PLANS ARE APPROXIMATE ONLY. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF SUCH UTILITIES, PROTECTING ALL EXISTING UTILITIES AND REPAIRING ANY DAMAGE DONE DURING CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ON-SITE COORDINATION WITH UTILITY COMPANIES AND PUBLIC AGENCIES AND FOR OBTAINING ALL REQUIRED PERMITS AND PAYING ALL REQUIRED FEES. IN ACCORDANCE WITH M.G.L. CHAPTER 82, SECTION 40, INCLUDING AMENDMENTS, CONTRACTORS SHALL NOTIFY ALL UTILITY COMPANIES AND GOVERNMENT AGENCIES IN WRITING PRIOR TO EXCAVATION. CONTRACTOR SHALL ALSO CALL "DIG SAFE" AT (888) 344-7233 NO LESS THAN 72 HOURS, (EXCLUSIVE OF WEEKENDS AND HOLIDAYS), PRIOR TO SUCH EXCAVATION. DOCUMENTATION OF REQUESTS SHALL BE PROVIDED TO OWNER'S REPRESENTATIVE PRIOR TO EXCAVATION WORK.
14. WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR AND THE INFORMATION FURNISHED TO THE OWNER'S REPRESENTATIVE FOR RESOLUTION OF THE CONFLICT.
15. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE AND ANY OTHER PRIVATE UTILITIES BY THE UTILITY OWNER AT NO ADDITIONAL COST TO THE CITY OF WORCESTER
16. CONTRACTOR SHALL BE RESPONSIBLE FOR REVIEWING ALL DRAWINGS AND SPECIFICATIONS TO DETERMINE THE EXTENT OF EXCAVATION AND DEMOLITION REQUIRED TO RECEIVE SITE IMPROVEMENTS.
17. ANY DISCREPANCIES OR CONFLICTS BETWEEN THE DRAWINGS AND EXISTING CONDITIONS, EXISTING CONDITIONS TO REMAIN, TEMPORARY CONSTRUCTION, PERMANENT CONSTRUCTION AND WORK OF ADJACENT CONTRACTS SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER'S REPRESENTATIVE BEFORE PROCEEDING. ITEMS ENCOUNTERED IN AREAS OF EXCAVATION THAT ARE NOT INDICATED ON THE DRAWINGS, BUT ARE VISIBLE ON SURFACE, SHALL BE THE CONTRACTOR'S RESPONSIBILITY AND SHALL BE REMOVED AT NO ADDITIONAL COST TO THE OWNER.
18. ANY ALTERATIONS TO THESE DRAWINGS MADE IN THE FIELD DURING CONSTRUCTION SHALL BE RECORDED BY THE GENERAL CONTRACTOR ON "AS BUILT" DRAWINGS.
19. ALL AREAS DISTURBED BY THE CONTRACTOR'S OPERATIONS OUTSIDE THE PROJECT LIMITS, SHALL BE RESTORED TO THE ORIGINAL CONDITION BY THE CONTRACTOR AT NO ADDITIONAL COST AND TO THE SATISFACTION OF THE OWNER.
20. ALL WORK SHOWN ON THE PLANS AS BOLD SHALL REPRESENT PROPOSED WORK. THE TERM "PROPOSED (PROP)" INDICATES WORK TO BE CONSTRUCTED USING NEW MATERIALS OR, WHERE APPLICABLE, RE-USING EXISTING MATERIALS IDENTIFIED AS "REMOVE AND RESET (R&R)" OR "REMOVE AND SALVAGE (R&S).
21. ALL KNOWN EXISTING STATE, COUNTY AND TOWN LOCATION LINES AND PRIVATE PROPERTY LINES HAVE BEEN ESTABLISHED FROM AVAILABLE INFORMATION AND ARE INDICATED ON THE PLANS.
22. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PROTECT HIS EMPLOYEES, AS WELL AS PUBLIC USERS FROM INJURY DURING THE ENTIRE CONSTRUCTION PERIOD USING ALL NECESSARY SAFEGUARDS, INCLUDING BUT NOT LIMITED TO, THE ERECTION OF TEMPORARY WALKS, STRUCTURES, PROTECTIVE BARRIERS, COVERING, OR FENCES AS NEEDED.
23. THE CONTRACTOR SHALL SUPPLY THE OWNER WITH THE NAME OF THE OSHA "COMPETENT PERSON" PRIOR TO CONSTRUCTION.
24. FILLING OF EXCAVATED AREAS SHALL NOT TAKE PLACE WITHOUT THE PRESENCE OR PERMISSION OF THE OWNER.
25. EXISTING TREES TO REMAIN SHALL BE PROTECTED FROM CONSTRUCTION ACTIVITIES. NO STOCKPILING OF MATERIAL, EQUIPMENT OR VEHICULAR TRAFFIC SHALL BE ALLOWED WITHIN THE DRIP LINE OF TREES TO REMAIN. NO GUYS SHALL BE ATTACHED TO ANY TREE TO REMAIN. WHEN NECESSARY OR AS DIRECTED BY THE OWNER'S REPRESENTATIVE, THE CONTRACTOR SHALL ERECT TEMPORARY BARRIERS FOR THE PROTECTION OF EXISTING TREES DURING CONSTRUCTION.
26. TREES AND SHRUBS WITHIN THE LIMITS OF WORK SHALL BE REMOVED ONLY UPON THE APPROVAL OF THE OWNER'S REPRESENTATIVE OR AS NOTED ON THE PLANS.
27. NO FILLING SHALL OCCUR AROUND EXISTING TREES TO REMAIN WITHOUT THE APPROVAL OF THE OWNER OR OWNER REPRESENTATIVE.
28. THE CONTRACTOR SHALL REMOVE ALL SURFACE VEGETATION PRIOR TO GRADING THE SITE. TREES AND STUMPS SHALL BE REMOVED AND DISPOSED COMPLETE BY CONTRACTOR. TEMPORARY EROSION CONTROL MEASURES SHOWN ON THE DRAWINGS (INCLUDING SILT FENCE, STRAW WATTLES, OR SILT SOCKS) AND SEDIMENT CURTAINS SHALL BE INSTALLED BY THE CONTRACTOR. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THESE TEMPORARY EROSION CONTROL MEASURES THROUGHOUT THE PROJECT WHICH COST SHALL BE INCIDENTAL TO THE PROJECT.
29. ALL UNSUITABLE EXCESS SOIL FROM CONSTRUCTION ACTIVITIES SHALL BE DISPOSED OF BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE CITY. REMOVAL ACTIVITIES SHALL BE ACCORDANCE WITH STATE AND LOCAL REGULATIONS AT NO ADDITIONAL COST TO THE TOWN. REFER TO WORCESTER CITY BY-LAWS REGARDING EARTH MOVEMENT. SUITABLE SOIL EXCAVATION AS PART OF THE PROJECT MUST MEET ONE OR MORE OF THE MATERIAL REQUIREMENTS SPECIFIED IN 31 00 00-EARTHWORK. IF THE CONTRACTOR PROPOSES TO USE THE EXISTING FILL ON SITE BELOW PAVEMENT AREAS, HE MUST DEMONSTRATE THAT THE FILL MEETS THE REQUIREMENTS PER THE SPECIFICATIONS. ALL EXCAVATED FILL MATERIAL WHICH DOES NOT MEET THE REQUIREMENTS OF THE CONTRACT DOCUMENTS SHALL BE REMOVED AND DISPOSED OF OFF-SITE AT NO ADDITIONAL COST.
30. CONTRACTOR IS RESPONSIBLE FOR STAKING CONSTRUCTION BASELINES IN FIELD WITH A MA. REGISTERED PROFESSIONAL LAND SURVEYOR. NO CONSTRUCTION WILL BE PERFORMED WITHOUT THE PROPOSED BASELINES AND LAYOUTS APPROVED BY THE ENGINEER.
31. NO FILL SHALL CONTAIN HAZARDOUS MATERIALS.
32. CONTRACTOR SHALL PROVIDE TEMPORARY CONSTRUCTION FENCING AROUND PERIMETER OF WORK AREA (LIMIT OF WORK). FENCE SHALL NOT IMPEDE TRAVEL WAYS.
33. ANY QUANTITIES SHOWN ON PLANS ARE FOR COMPARATIVE BIDDING PURPOSES ONLY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VISIT THE PROJECT SITE TO VERIFY ALL QUANTITIES AND CONDITIONS PRIOR TO SUBMITTING BID.
34. ALL EXISTING DRAINAGE FACILITIES TO REMAIN SHALL BE MAINTAINED FREE OF DEBRIS, SOIL, SEDIMENT, AND FOREIGN MATERIAL AND OPERATIONAL THROUGHOUT THE LIFE OF THE CONTRACT. REMOVE ALL SOIL, SEDIMENT, DEBRIS AND FOREIGN MATERIAL FROM ALL DRAINAGE STRUCTURES, INCLUDING BUT NOT LIMITED TO, DRAINAGE INLETS, MANHOLES AND CATCH BASINS WITHIN THE LIMIT OF WORK AND DRAINAGE STRUCTURES OUTSIDE THE LIMIT OF WORK THAT ARE IMPACTED BY THE WORK FOR THE ENTIRE DURATION OF CONSTRUCTION.
35. CONTRACTOR'S STAGING AREA MUST BE WITHIN THE CONTRACT LIMIT LINE AND IN AREAS APPROVED BY OWNER. ANY OTHER AREAS THAT THE CONTRACTOR MAY WISH TO USE FOR STAGING MUST BE COORDINATED WITH THE OWNER.
36. THE CONTRACTOR SHALL KEEP ALL STREETS, PARKING LOTS AND WALKS THAT ARE NOT RESTRICTED FROM PUBLIC USE DURING CONSTRUCTION BROOM CLEAN AT ALL TIMES. THE CONTRACTOR SHALL USE ACCEPTABLE METHODS AND MATERIALS TO MAINTAIN ADEQUATE DUST CONTROL THROUGHOUT CONSTRUCTION.
37. CONTRACTOR SHALL COORDINATE ALL WORK WITH THE OWNER.
38. THE LIMIT OF WORK SHALL BE DELINEATED IN THE FIELD PRIOR TO THE START OF SITE CLEARING OR CONSTRUCTION AND AGREED UPON WITH THE OWNER'S REPRESENTATIVE.
39. DEEP SUMP CATCH BASINS AND STORMWATER BASINS SHALL BE CLEANED FOLLOWING CONSTRUCTION AND SHALL FOLLOW THE OPERATION AND MAINTENANCE PLAN THEREAFTER.
40. HAULING OF EARTH MATERIALS TO AND FROM THE SITE SHALL BE RESTRICTED TO THE HOURS OF 7 AM TO 5 PM.
41. ANY BOULDERS 3 CY OR SMALLER SHALL BE CONSIDERED UNDOCUMENTED FILL AND SHALL BE DISPOSED OF AT NO ADDITIONAL COST TO THE CITY.
42. WORK ON WEEKENDS SHALL ONLY BE CONDUCTED IF PRIOR WRITTEN PERMISSION IS PROVIDED BY THE CITY.
43. NO TRUCKS SHALL BE LEFT IDLING ON CITY STREETS DURING CONSTRUCTION. CONSTRUCTION TRAFFIC AT NO TIME SHALL IMPEDE FLOW OF RESIDENT TRAFFIC.

DEMOLITION & SITE PREPARATION NOTES:

1. THE CONTRACTOR SHALL INCLUDE IN THE BID THE COST OF REMOVING ANY EXISTING SITE FEATURES AND APPURTENANCES NECESSARY TO ACCOMPLISH THE CONSTRUCTION OF THE PROPOSED SITE IMPROVEMENTS. THE CONTRACTOR SHALL ALSO INCLUDE IN THE BID THE COST NECESSARY TO RESTORE SUCH ITEMS IF THEY ARE SCHEDULED TO REMAIN AS PART OF THE FINAL SITE IMPROVEMENTS. REFER TO PLANS TO DETERMINE EXCAVATION AND DEMOLITION REQUIREMENTS AND TO DETERMINE THE LOCATION OF THE PROPOSED SITE IMPROVEMENTS.
2. THE OWNER RESERVES THE RIGHT TO REVIEW ALL MATERIALS DESIGNATED FOR REMOVAL AND TO RETAIN OWNERSHIP OF SUCH MATERIALS. IF THE OWNER RETAINS ANY MATERIAL THE CONTRACTOR SHALL MAKE ARRANGEMENTS WITH THE OWNER TO HAVE THOSE MATERIALS REMOVED OFF SITE TO A DESIGNATED MUNICIPAL PROPERTY AT NO ADDITIONAL COST. ALL GEOTECHNICALLY OR UNSUITABLE EXCESS SOIL FROM CONSTRUCTION ACTIVITIES SHALL BE DISPOSED OF BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE CITY. REMOVAL ACTIVITIES SHALL BE ACCORDANCE WITH STATE AND LOCAL REGULATIONS AT NO ADDITIONAL COST TO THE CITY.
3. UNLESS SPECIFICALLY NOTED TO BE REMOVED AND STOCKPILED (R&S) OR REUSED AND RELOCATED (R&R), ALL SITE FEATURES CALLED TO BE REMOVED AND DEMOLISHED (R&D) SHALL BE REMOVED WITH THEIR FOOTINGS, ATTACHMENTS, BASE MATERIAL, ETC. TRANSPORTED FROM THE SITE TO BE DISPOSED OF IN A LAWFUL MANNER AT AN ACCEPTABLE DISPOSAL SITE AND AT NO ADDITIONAL COST TO THE OWNER.
4. ALL EXISTING SITE FEATURES TO REMAIN SHALL BE PROTECTED THROUGHOUT THE CONSTRUCTION PERIOD ANY FEATURES DAMAGED DURING CONSTRUCTION OPERATIONS SHALL BE REPAIRED OR REPLACED TO THE SATISFACTION OF THE OWNER AND/OR OWNER'S REPRESENTATIVE AT NO ADDITIONAL COST.
5. DURING EARTHWORK OPERATIONS, CONTRACTOR SHALL TAKE CARE TO NOT DISTURB EXISTING MATERIALS TO REMAIN. OUTSIDE THE LIMITS OF EXCAVATION AND BACKFILL AND SHALL TAKE WHATEVER MEASURES NECESSARY, AT THE CONTRACTOR'S EXPENSE, TO PREVENT ANY EXCAVATED MATERIAL FROM COLLAPSING. ALL BACKFILL MATERIALS SHALL BE PLACED AND COMPACTED AS SPECIFIED TO THE SUBGRADE REQUIRED FOR THE INSTALLATION OF THE REMAINDER OF THE CONTRACT WORK.
6. STRIP & STOCKPILE EXISTING TOPSOIL FOR LATER REUSE AS REQUIRED. STOCKPILE SHALL HAVE APPROPRIATE EROSION AND SEDIMENT CONTROLS. THE CONTRACTOR SHALL CONFIRM THROUGH ALL REQUIRED TESTING THAT THE TOPSOIL IS SUITABLE FOR REUSE AND IT MEETS THE REQUIREMENTS OF THE SPECIFICATIONS FOR TOPSOIL LOAM BORROW AT NO ADDITIONAL COST TO THE OWNER.
7. CLEAR AND GRUB VEGETATION SHALL INCLUDE REMOVAL OF ALL GRASS/LAWN, SHRUBS, AND UNDERBRUSH, REMOVAL OF ROOTS, AND ROUGH GRADING. INSTALLATION OF LOAM (IF APPLICABLE), FINE GRADING, SEEDING AND TURF OR VEGETATION ESTABLISHMENT BY THE CONTRACTOR.
8. THE CONTRACTOR SHALL PROTECT EXISTING TREES TO REMAIN. CONTRACTOR SHALL INSTALL TREE PROTECTION BARRIERS AFTER CLEARING TURF AND UNDERBRUSH BY HAND AND TAKE DUE CARE TO PREVENT INJURY TO TREES DURING CLEARING OPERATIONS.

EROSION AND SEDIMENT CONTROL NOTES

1. 3' HT TEMPORARY ORANGE SNOW FENCE TO BE INSTALLED ALONG WETLAND AREA.
2. ALL SEDIMENT AND EROSION CONTROL DEVICES SHALL BE PUT INTO PLACE PRIOR TO BEGINNING ANY CONSTRUCTION OR DEMOLITION. REFER TO PLANS FOR APPROXIMATE LOCATION OF EROSION AND SEDIMENT CONTROL. REFER TO SPECS AND DETAILS FOR TYPE OF EROSION AND SEDIMENT CONTROL.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CONTINUAL MAINTENANCE OF ALL CONTROL DEVICES THROUGHOUT THE DURATION OF THE PROJECT.
4. CONTRACTOR SHALL MEET ALL OF THE STATE OF MASSACHUSETTS AND THE CITY OF WORCESTER WETLAND ORDINANCE REGULATIONS FOR SEDIMENT AND EROSION CONTROL.
5. EXCAVATED MATERIAL STOCKPILED ON THE SITE SHALL BE SURROUNDED BY A RING OF UNBROKEN SEDIMENT AND EROSION CONTROL FENCE. THE LIMITS OF ALL GRADING AND DISTURBANCE SHALL BE KEPT TO A MINIMUM WITHIN THE APPROVED AREA OF CONSTRUCTION. ALL AREAS OUTSIDE OF THE LIMIT OF CONTRACT SHALL REMAIN TOTALLY UNDISTURBED UNLESS OTHERWISE APPROVED BY OWNER'S REPRESENTATIVE.
6. ALL CATCH BASINS AND DRAIN GRATES WITHIN THE LIMIT OF WORK SHALL BE PROTECTED WITH SILT SACKS DURING THE ENTIRE DURATION OF CONSTRUCTION.
7. EROSION CONTROL BARRIERS TO BE INSTALLED AT THE TOE OF SLOPES. SEE GRADING & DRAINAGE PLANS, NOTES, DETAILS AND SPECIFICATIONS.
8. THE CONTRACTOR SHALL PROVIDE DUST CONTROL FOR CONSTRUCTION OPERATIONS AS APPROVED BY THE OWNER'S REPRESENTATIVE AND MASSACHUSETTS D.E.P. REQUIREMENTS.
9. ALL POINTS OF CONSTRUCTION EGRESS OR INGRESS SHALL BE MAINTAINED TO PREVENT TRACKING OR FLOWING OF SEDIMENT ON TO PUBLIC/PRIVATE ROADS.
10. ALL MATERIAL HAULING VEHICLES SHALL BE COMPLETELY COVERED PRIOR TO LEAVING THE SITE.
11. CONTRACTOR SHALL BE RESPONSIBLE FOR WHEEL CLEANING OF ALL CONSTRUCTION VEHICLES PRIOR TO EXITING THE SITE. CONTRACTOR SHALL ENSURE THAT MATERIAL HAULING VEHICLES REMAIN ON PAVED SURFACES AS MUCH AS POSSIBLE

LAYOUT NOTES:

1. COORDINATE ALL LAYOUT ACTIVITIES WITH THE SCOPE OF WORK CALLED FOR BY DEMOLITION, GRADING AND UTILITIES OPERATIONS ENCOMPASSED BY THIS CONTRACT. SET, PROTECT AND REPLACE REFERENCE STAKES AS NECESSARY OR AS REQUIRED BY THE OWNER'S REPRESENTATIVE.
2. ALL WORK SHALL BE PERFORMED BY CONTRACTOR UNLESS SPECIFICALLY INDICATED THAT THE WORK WILL BE PERFORMED "BY OWNER".
3. THE LAYOUT OF SITE AMENITIES AND FENCES MUST BE APPROVED BY THE OWNER'S REPRESENTATIVE PRIOR TO INSTALLATION.
4. ALL PROPOSED SITE FEATURES SHALL BE LAID OUT AND STAKED FOR REVIEW AND APPROVAL BY THE OWNER'S REPRESENTATIVE PRIOR TO COMMENCEMENT OF INSTALLATION. ANY REQUIRED ADJUSTMENTS TO THE LAYOUT SHALL BE UNDERTAKEN AS DIRECTED, AT NO ADDITIONAL COST TO THE OWNER.
5. ALL PROPOSED PAVEMENTS SHALL MEET THE LINE AND GRADE OF EXISTING ADJACENT PAVEMENT SURFACES AND SHALL BE TREATED WITH AN RS-1 TACK COAT AT POINT OF CONNECTION. ALL PATHWAY WIDTHS SHALL BE AS NOTED ON THE LAYOUT AND MATERIALS PLAN.
6. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND GRADES ON THE GROUND AND REPORT ANY DISCREPANCIES IMMEDIATELY TO THE OWNER.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD MEASUREMENTS OF ALL PROPOSED FENCES, GATES.

GRADING & DRAINAGE NOTES:

1. ALL WORK RELATING TO INSTALLATION, RENOVATION OR MODIFICATION OF DRAINAGE SERVICES SHALL BE PERFORMED IN ACCORDANCE WITH THE STANDARDS OF THE CITY OF WORCESTER AND ITS DEPARTMENT OF PUBLIC WORKS.
2. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, GRADES AND INVERT ELEVATIONS IN THE FIELD AND REPORT ANY DISCREPANCIES IMMEDIATELY TO THE OWNER AND OWNER'S REPRESENTATIVE.
3. ALL NEW WALKWAYS MUST CONFORM TO DRAWINGS AND TO CURRENT AMERICANS WITH DISABILITIES ACT (ADA) REGULATIONS. WALKWAYS SHALL MAINTAIN A CROSS PITCH OF NOT MORE THAN TWO (2%) PERCENT MAXIMUM AND THE RUNNING SLOPE (PARALLEL TO THE DIRECTION OF TRAVEL) OF FIVE (5%) PERCENT MAXIMUM.
4. MINIMUM SLOPE ON ALL WALKWAYS WILL BE 1:100 OR 1% TO PROVIDE POSITIVE DRAINAGE. ANY DISCREPANCIES NOT ALLOWING THIS TO OCCUR SHALL BE REPORTED TO THE OWNER'S REPRESENTATIVE PRIOR TO CONTINUING WORK.
5. ALL UTILITY GRATES, COVERS OR OTHER SURFACE ELEMENTS INTENDED TO BE EXPOSED AT GRADE SHALL BE FLUSH WITH THE ADJACENT FINISHED GRADE AND ADJUSTED TO PROVIDE A SMOOTH TRANSITION AT ALL EDGES.
6. THE CONTRACTOR SHALL SET SUBGRADE ELEVATIONS TO ALLOW FOR POSITIVE DRAINAGE AND PROVIDE EROSION CONTROL DEVICES, STRUCTURES, MATERIALS AND CONSTRUCTION METHODS TO DIRECT SILT MIGRATION AWAY FROM DRAINAGE AND OTHER UTILITY SYSTEMS, PUBLIC/ PRIVATE STREETS AND WORK AREAS. CLEAN BASINS REGULARLY AND AT THE END OF THE PROJECT.
7. CONTRACTOR SHALL ENSURE ALL AREAS ARE PROPERLY PITCHED TO DRAIN, WITH NO SURFACE WATER PONDING OR PUDDLING.
8. EXCAVATION REQUIRED WITHIN PROXIMITY OF KNOWN EXISTING UTILITY LINES SHALL BE DONE BY HAND. CONTRACTOR SHALL REPAIR ANY DAMAGE TO EXISTING UTILITY LINES OR STRUCTURES INCURRED DURING CONSTRUCTION OPERATIONS AT NO COST TO THE OWNER.
9. WHERE NEW EARTHWORK MEETS EXISTING EARTHWORK, CONTRACTOR SHALL BLEND NEW EARTHWORK SMOOTHLY INTO EXISTING, PROVIDING VERTICAL CURVES OR POUNDS AT ALL TOP AND BOTTOM OF SLOPES.
10. WHERE A SPECIFIC LIMIT OF WORK LINE IS NOT OBVIOUS OR IMPLIED, BLEND GRADES TO EXISTING CONDITIONS WITHIN 5 FEET OF PROPOSED CONTOURS.
11. RESTORE ALL DISTURBED AREAS AND LIMITS OF ALL REMOVALS TO LOAM AND SPECIFIED CONSERVATION SEED MIX UNLESS OTHERWISE NOTED.
12. WHERE NEW IMPROVEMENTS MEET EXISTING CONDITIONS, MEET LINE AND GRADE OF EXISTING ADJACENT PAVEMENTS, TYPICAL.

Project:
BELL POND PARK IMPROVEMENTS
WORCESTER, MA

196 BELMONT ST.
WORCESTER, MA 01605

Weston & Sampson
Weston & Sampson Engineers, Inc.
427 Main Street, Suite 400
Worcester, MA 01608
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:
NAULT ARCHITECTS INC.
71 Hope Avenue,
Worcester, MA 01603
508.755.6134
admin@naultarchitects.com

Revisions:

No.	Date	Description

COA:

Seal:
COMMONWEALTH OF MASSACHUSETTS
Brandon Mackenzie
No. 40
REGISTERED LANDSCAPE ARCHITECT

Issued For:
PERMIT SET
-NOT FOR CONSTRUCTION-

Scale: AS SHOWN

Date: March 22, 2023
Drawn By: TZ
Reviewed By: MS
Approved By: BK

W&S Project No.: ENG22-0194
W&S File No.:

Drawing Title:
GENERAL NOTES

Sheet Number:
L001

P:\MA\Worcester MA\ENG22\0194 Bell Pond Improvements\CAD\Sheet\001-GN.dwg

LIMIT OF WORK
"PED XING"
CB#1467
OAK
CUT OFF
UP#15 W/TRAN. & 8 RISERS
"BELL HILL PARK"
CB#1116
"BELL HILL PARK"
10" LOCUST
8" LOCUST
100' WETLAND BUFFER ZONE
50' WETLAND BUFFER ZONE
30' WETLAND BUFFER ZONE
15' WETLAND BUFFER ZONE
BVW-A1
BVW-A2
BVW-A3
BVW-A4
TOB-B5
TOB-B7
TOB-B8
TOB-B9
BORDERING VEGETATED WETLAND A
"WARNING SUDDEN DROP OFF"
"WARNING DROP OFF"
DMH#1472
CB#1477
CB#1502
CB#1485
CHAIN
8" LOCUST
UP W/ NO WIRES
6" GINKO
TP-3
"BEACH CLOSED NO DOGS"
"NO DOGS ON BEACH"
TOB-B10
12" LOCUST
12" LOCUST
"HCAP PARKING"
TP-1
TP-2
28" MAPLE
100' STORMWATER PROTECTION ZONE
LIMIT OF WORK
"DANGER NO SWIMMING"
TOB-B11
"WARNING SUDDEN DROP OFF"
TOP OF BANK
BORDERING VEGETATED WETLAND B
TOB-B1
BVW-B5
BVW-B4
TOB-B14
TOB-B13
BVW-B3
BVW-B2
BVW-B1
TOB-B16
TOB-B17
TOB-B18
18" OAK
TOB-B19
2" OAK
TOB-B20
TOB-B21
24" ELM
20" ELM
28" ELM
100' WETLAND BUFFER ZONE
50' WETLAND BUFFER ZONE
30' WETLAND BUFFER ZONE
15' WETLAND BUFFER ZONE
LIMIT OF WORK
BELMONT STREET (ROUTE 9)
BELL POND

LEGEND

PROPERTY LINE	38A–154–001	ASSESSORS ID
LIMIT OF WORK	N/F	NOW OR FORMERLY
EXISTING RETAINING WALL	GBF	GRANITE BOUND FOUND
EDGE OF WATER	IRF IPF	IRON ROD OR PIPE FOUND
TOP OF BANK		CALCULATED POINT
WETLAND EDGE (BVW-A1)		UTILITY POLE
WETLAND BUFFER ZONE LINE		GUY WIRE ANCHOR
100' STORMWATER PROTECTION ZONE		MANHOLE
TREE LINE		CATCH BASIN
EX. CHAIN LINK FENCE		PIPE INLET / OUTLET
EX. STOCKADE FENCE		WATER GATE VALVE
EX. GUARDRAIL		SPIGOT
EXISTING MINOR CONTOUR LINE (674)		VERTICAL PIPE
EXISTING MAJOR CONTOUR LINE (675)		TEMPORARY BENCH MARK (TBM)
DRAINAGE LINE (D)		SIGN POST
SEWER LINE (S)		BOLLARD/POST
WATER LINE (W)		FLAG POLE
GAS LINE (G)		WETLAND FLAG
ELECTRICAL LINE (E)		TRAFFIC CONTROL BOX
TELECOMMUNICATIONS LINE (C)	TOB	TOP OF BANK
EXISTING TREE	EX.	EXISTING
	CONC.	CONCRETE
	BIT.	BITUMINOUS
	RET.	RETAINING
	TP-1	TEST PIT

0 20 40 60

SCALE 1"=20'

P:\NW\Worcester MA\EN22\0194 Bell Pond Improvements\CAD\Sht\L100.dwg

Project:
BELL POND PARK IMPROVEMENTS
WORCESTER, MA

196 BELMONT ST,
WORCESTER, MA 01605

Weston & Sampson Engineers, Inc.
427 Main Street, Suite 400
Worcester, MA 01608
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:
NAULT ARCHITECTS INC.
71 Hope Avenue,
Worcester, MA 01603
508.755.6134
admin@naultarchitects.com

Revisions:

No.	Date	Description

COA:

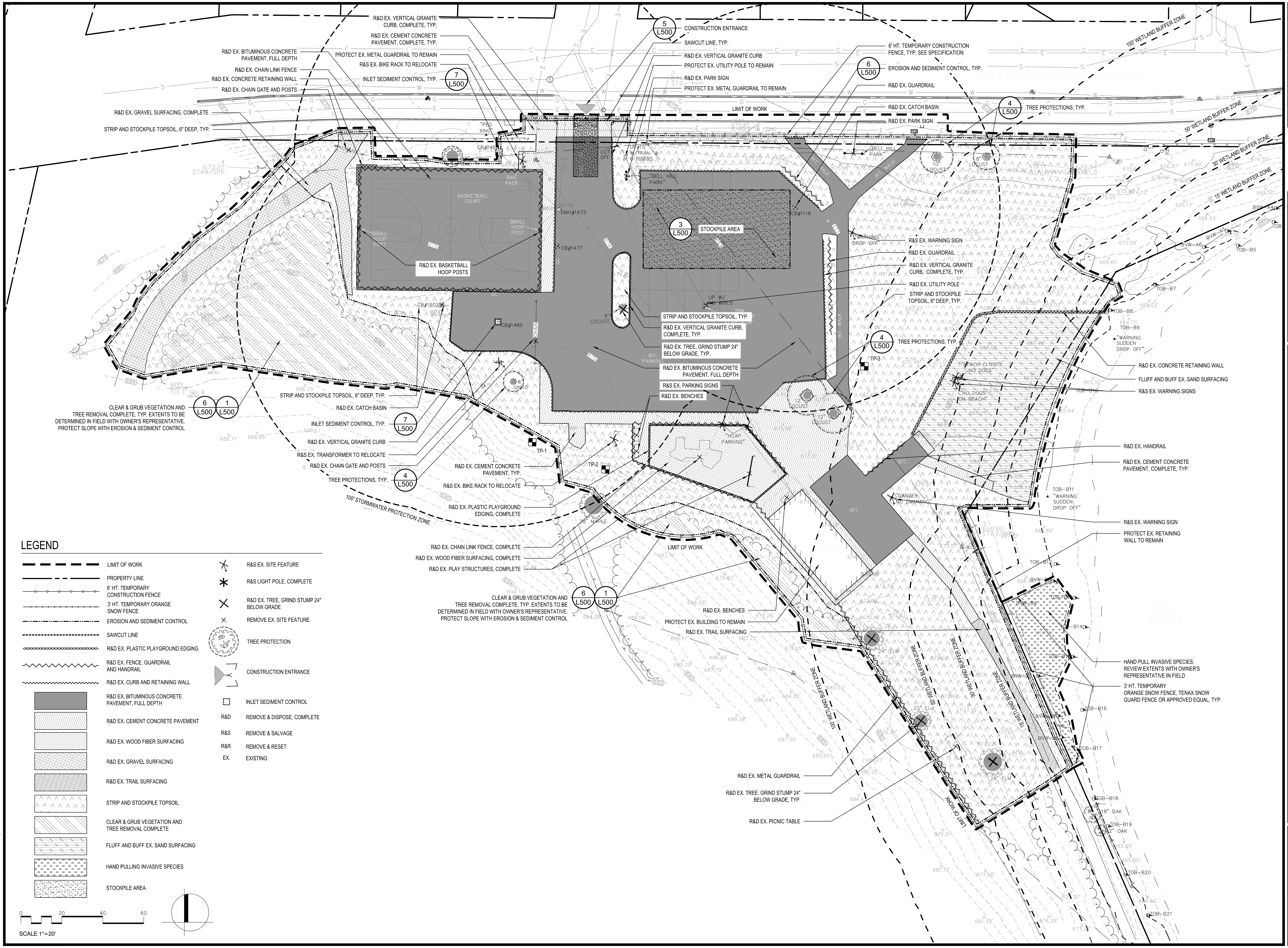
Sea
MASSACHUSETTS Brandon M. Kuchar No. 4040 REGISTERED LANDSCAPE ARCHITECT

Issued For:
PERMIT SET
-NOT FOR CONSTRUCTION-

Scale:	AS SHOWN
Date:	March 22, 2023
Drawn By:	TZ
Reviewed By:	MS
Approved By:	BK
W&S Project No.:	ENG22-0194
W&S File No.:	

Drawing Title:
EXISTING CONDITIONS PLAN

Sheet Number:
L100


R&D EX. VERTICAL GRANITE CURB, COMPLETE, TYP.
R&D EX. CEMENT CONCRETE PAVEMENT, COMPLETE, TYP.
R&D EX. BITUMINOUS CONCRETE PAVEMENT, FULL DEPTH
PROTECT EX. METAL GUARDRAIL TO REMAIN
R&S EX. BIKE RACK TO RELOCATE
R&D EX. CHAIN LINK FENCE
R&D EX. CONCRETE RETAINING WALL
INLET SEDIMENT CONTROL, TYP.
R&D EX. CHAIN GATE AND POSTS
R&D EX. GRAVEL SURFACING, COMPLETE
STRIP AND STOCKPILE TOPSOIL, 6" DEEP, TYP.
CONSTRUCTION ENTRANCE
SAWCUT LINE, TYP.
R&D EX. VERTICAL GRANITE CURB
PROTECT EX. UTILITY POLE TO REMAIN
R&D EX. PARK SIGN
PROTECT EX. METAL GUARDRAIL TO REMAIN
LIMIT OF WORK
6' HT. TEMPORARY CONSTRUCTION FENCE, TYP. SEE SPECIFICATION
EROSION AND SEDIMENT CONTROL, TYP.
R&D EX. GUARDRAIL
R&D EX. CATCH BASIN
R&D EX. PARK SIGN
TREE PROTECTIONS, TYP.
100' WETLAND BUFFER ZONE
50' WETLAND BUFFER ZONE
30' WETLAND BUFFER ZONE
15' WETLAND BUFFER ZONE
BASKETBALL COURT
R&D EX. BASKETBALL HOOP POSTS
STOCKPILE AREA
R&S EX. WARNING SIGN
R&D EX. GUARDRAIL
R&D EX. VERTICAL GRANITE CURB, COMPLETE, TYP.
R&D EX. UTILITY POLE
STRIP AND STOCKPILE TOPSOIL, 6" DEEP, TYP.
STRIP AND STOCKPILE TOPSOIL, TYP.
R&D EX. VERTICAL GRANITE CURB, COMPLETE, TYP.
R&D EX. TREE, GRIND STUMP 24" BELOW GRADE, TYP.
R&D EX. BITUMINOUS CONCRETE PAVEMENT, FULL DEPTH
R&S EX. PARKING SIGNS
R&D EX. BENCHES
TREE PROTECTIONS, TYP.
R&D EX. CONCRETE RETAINING WALL
FLUFF AND BUFF EX. SAND SURFACING
R&S EX. WARNING SIGNS
CLEAR & GRUB VEGETATION AND TREE REMOVAL COMPLETE, TYP. EXTENTS TO BE DETERMINED IN FIELD WITH OWNER'S REPRESENTATIVE. PROTECT SLOPE WITH EROSION & SEDIMENT CONTROL
STRIP AND STOCKPILE TOPSOIL, 6" DEEP, TYP.
R&D EX. CATCH BASIN
INLET SEDIMENT CONTROL, TYP.
R&D EX. VERTICAL GRANITE CURB
R&S EX. TRANSFORMER TO RELOCATE
R&D EX. CHAIN GATE AND POSTS
TREE PROTECTIONS, TYP.
R&D EX. CEMENT CONCRETE PAVEMENT, TYP.
R&S EX. BIKE RACK TO RELOCATE
R&D EX. PLASTIC PLAYGROUND EDGING, COMPLETE
100' STORMWATER PROTECTION ZONE
R&D EX. HANDRAIL
R&D EX. CEMENT CONCRETE PAVEMENT, COMPLETE, TYP.
R&S EX. WARNING SIGN
PROTECT EX. RETAINING WALL TO REMAIN
R&D EX. CHAIN LINK FENCE, COMPLETE
R&D EX. WOOD FIBER SURFACING, COMPLETE
R&D EX. PLAY STRUCTURES, COMPLETE
R&D EX. BENCHES
PROTECT EX. BUILDING TO REMAIN
R&D EX. TRAIL SURFACING
HAND PULL INVASIVE SPECIES, REVIEW EXTENTS WITH OWNER'S REPRESENTATIVE IN FIELD
3' HT. TEMPORARY ORANGE SNOW FENCE, TENAX SNOW GUARD FENCE OR APPROVED EQUAL, TYP.
R&D EX. METAL GUARDRAIL
R&D EX. TREE, GRIND STUMP 24" BELOW GRADE, TYP.
R&D EX. PICNIC TABLE
LEGEND
LIMIT OF WORK
PROPERTY LINE
6' HT. TEMPORARY CONSTRUCTION FENCE
3' HT. TEMPORARY ORANGE SNOW FENCE
EROSION AND SEDIMENT CONTROL
SAWCUT LINE
R&D EX. PLASTIC PLAYGROUND EDGING
R&D EX. FENCE, GUARDRAIL AND HANDRAIL
R&D EX. CURB AND RETAINING WALL
R&D EX. BITUMINOUS CONCRETE PAVEMENT, FULL DEPTH
R&D EX. CEMENT CONCRETE PAVEMENT
R&D EX. WOOD FIBER SURFACING
R&D EX. GRAVEL SURFACING
R&D EX. TRAIL SURFACING
STRIP AND STOCKPILE TOPSOIL
CLEAR & GRUB VEGETATION AND TREE REMOVAL COMPLETE
FLUFF AND BUFF EX. SAND SURFACING
HAND PULLING INVASIVE SPECIES
STOCKPILE AREA
R&S EX. SITE FEATURE
R&S LIGHT POLE, COMPLETE
R&D EX. TREE, GRIND STUMP 24" BELOW GRADE
REMOVE EX. SITE FEATURE
TREE PROTECTION
CONSTRUCTION ENTRANCE
INLET SEDIMENT CONTROL
R&D REMOVE & DISPOSE, COMPLETE
R&S REMOVE & SALVAGE
R&R REMOVE & RESET
EX. EXISTING
SCALE 1"=20'

Project:
BELL POND PARK IMPROVEMENTS
WORCESTER, MA

196 BELMONT ST.
WORCESTER, MA 01605

Weston & Sampson
Weston & Sampson Engineers, Inc.
427 Main Street, Suite 400
Worcester, MA 01608
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:
NAULT ARCHITECTS INC.
71 Hope Avenue,
Worcester, MA 01603
508.755.6134
admin@naultarchitects.com

Revisions:

No.	Date	Description

COA:

Seal:

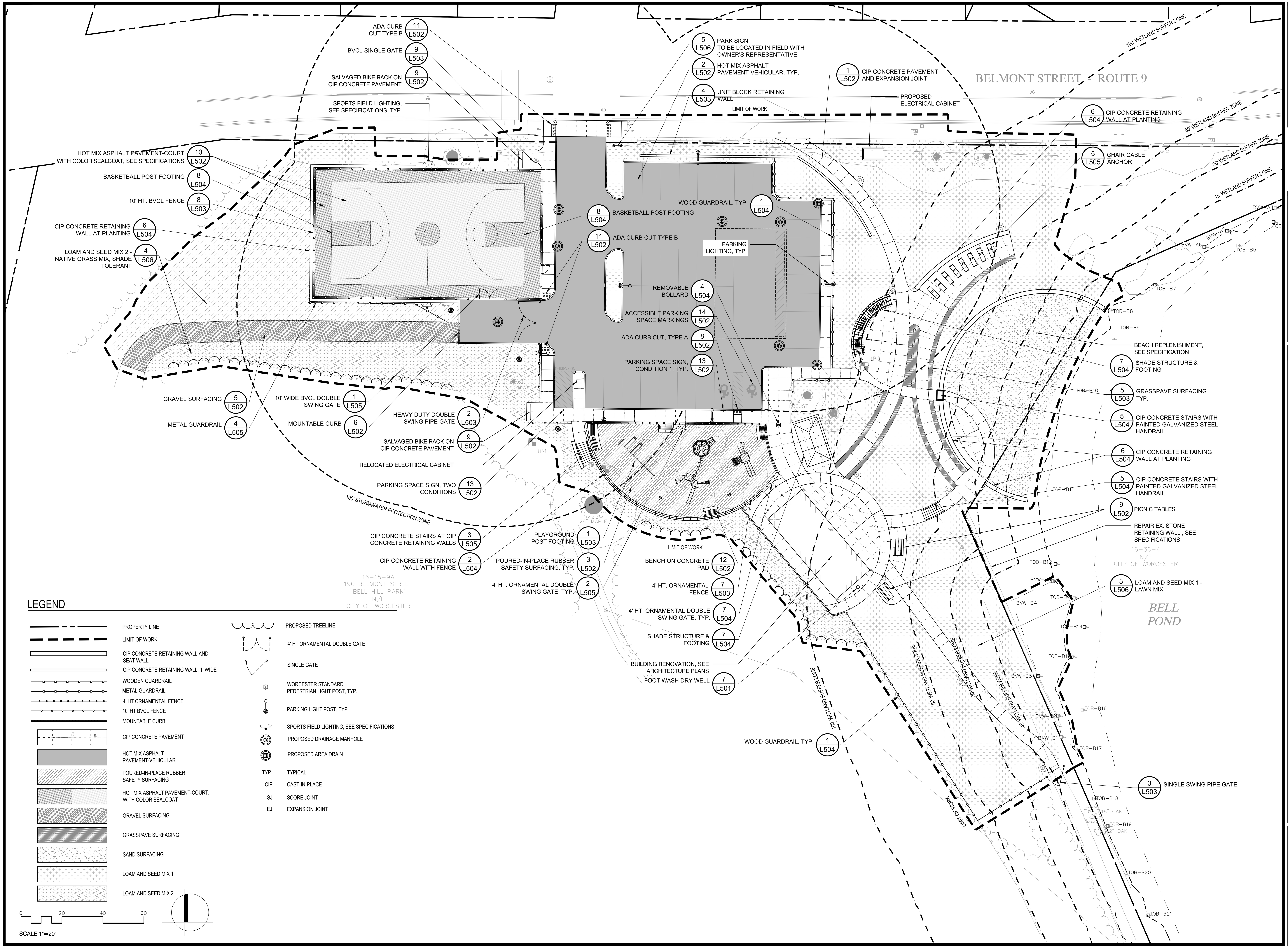
Issued For:
PERMIT SET
-NOT FOR CONSTRUCTION-

Scale: AS SHOWN

Date:	March 22, 2023
Drawn By:	TZ
Reviewed By:	MS
Approved By:	BK
W&S Project No.:	ENG22-0194
W&S File No.:	

Drawing Title:
SITE PREPARATION PLAN

Sheet Number:
L110



BELMONT STREET - ROUTE 9
ADA CURB CUT TYPE B 11 L502
BVCL SINGLE GATE 9 L503
SALVAGED BIKE RACK ON CIP CONCRETE PAVEMENT 9 L502
SPORTS FIELD LIGHTING, SEE SPECIFICATIONS, TYP.
HOT MIX ASPHALT PAVEMENT-COURT WITH COLOR SEALCOAT, SEE SPECIFICATIONS 10 L502
BASKETBALL POST FOOTING 8 L504
10' HT. BVCL FENCE 8 L503
CIP CONCRETE RETAINING WALL AT PLANTING 6 L504
LOAM AND SEED MIX 2 - NATIVE GRASS MIX, SHADE TOLERANT 4 L506
GRAVEL SURFACING 5 L502
METAL GUARDRAIL 4 L505
10' WIDE BVCL DOUBLE SWING GATE 1 L505
MOUNTABLE CURB 6 L502
HEAVY DUTY DOUBLE SWING PIPE GATE 2 L503
SALVAGED BIKE RACK ON CIP CONCRETE PAVEMENT 9 L502
RELOCATED ELECTRICAL CABINET
PARKING SPACE SIGN, TWO CONDITIONS 13 L502
100' STORMWATER PROTECTION ZONE
CIP CONCRETE STAIRS AT CIP CONCRETE RETAINING WALLS 3 L505
CIP CONCRETE RETAINING WALL WITH FENCE 2 L504
PLAYGROUND POST FOOTING 1 L503
POURED-IN-PLACE RUBBER SAFETY SURFACING, TYP. 3 L502
4' HT. ORNAMENTAL DOUBLE SWING GATE, TYP. 2 L505
PARK SIGN TO BE LOCATED IN FIELD WITH OWNER'S REPRESENTATIVE 5 L506
HOT MIX ASPHALT PAVEMENT-VEHICULAR, TYP. 2 L502
UNIT BLOCK RETAINING WALL 4 L503
LIMIT OF WORK
CIP CONCRETE PAVEMENT AND EXPANSION JOINT 1 L502
PROPOSED ELECTRICAL CABINET
WOOD GUARDRAIL, TYP. 1 L504
BASKETBALL POST FOOTING 8 L504
ADA CURB CUT TYPE B 11 L502
PARKING LIGHTING, TYP.
REMOVABLE BOLLARD 4 L504
ACCESSIBLE PARKING SPACE MARKINGS 14 L502
ADA CURB CUT, TYPE A 8 L502
PARKING SPACE SIGN, CONDITION 1, TYP. 13 L502
TP-1
TP-3
28" MAPLE
OAK
BENCH ON CONCRETE PAD 12 L502
4' HT. ORNAMENTAL FENCE 7 L503
4' HT. ORNAMENTAL DOUBLE SWING GATE, TYP. 7 L504
SHADE STRUCTURE & FOOTING 7 L504
BUILDING RENOVATION, SEE ARCHITECTURE PLANS
FOOT WASH DRY WELL 7 L501
WOOD GUARDRAIL, TYP. 1 L504
16-15-9A
190 BELMONT STREET
"BELL HILL PARK"
N/F
CITY OF WORCESTER
100' WETLAND BUFFER ZONE
50' WETLAND BUFFER ZONE
30' WETLAND BUFFER ZONE
15' WETLAND BUFFER ZONE
CIP CONCRETE RETAINING WALL AT PLANTING 6 L504
CHAIR CABLE ANCHOR 5 L505
BEACH REPLENISHMENT, SEE SPECIFICATION
SHADE STRUCTURE & FOOTING 7 L504
GRASSPAVE SURFACING TYP. 5 L503
CIP CONCRETE STAIRS WITH PAINTED GALVANIZED STEEL HANDRAIL 5 L504
CIP CONCRETE RETAINING WALL AT PLANTING 6 L504
CIP CONCRETE STAIRS WITH PAINTED GALVANIZED STEEL HANDRAIL 5 L504
PICNIC TABLES 9 L502
REPAIR EX. STONE RETAINING WALL , SEE SPECIFICATIONS
16-36-4
N/F
CITY OF WORCESTER
LOAM AND SEED MIX 1 - LAWN MIX 3 L506
BELL POND
SINGLE SWING PIPE GATE 3 L503
LIMIT OF WORK
TOB-B7
TOB-B8
TOB-B9
TOB-B10
TOB-B11
TOB-B14
TOB-B16
TOB-B17
TOB-B18
TOB-B19
TOB-B20
TOB-B21
BVW-A6
BVW-B4
BVW-B3
BVW-B1
LEGEND
PROPERTY LINE
LIMIT OF WORK
CIP CONCRETE RETAINING WALL AND SEAT WALL
CIP CONCRETE RETAINING WALL, 1' WIDE
WOODEN GUARDRAIL
METAL GUARDRAIL
4' HT ORNAMENTAL FENCE
10' HT BVCL FENCE
MOUNTABLE CURB
CIP CONCRETE PAVEMENT
HOT MIX ASPHALT PAVEMENT-VEHICULAR
POURED-IN-PLACE RUBBER SAFETY SURFACING
HOT MIX ASPHALT PAVEMENT-COURT, WITH COLOR SEALCOAT
GRAVEL SURFACING
GRASSPAVE SURFACING
SAND SURFACING
LOAM AND SEED MIX 1
LOAM AND SEED MIX 2
PROPOSED TREELINE
4' HT ORNAMENTAL DOUBLE GATE
SINGLE GATE
WORCESTER STANDARD PEDESTRIAN LIGHT POST, TYP.
PARKING LIGHT POST, TYP.
SPORTS FIELD LIGHTING, SEE SPECIFICATIONS
PROPOSED DRAINAGE MANHOLE
PROPOSED AREA DRAIN
TYP. TYPICAL
CIP CAST-IN-PLACE
SJ SCORE JOINT
EJ EXPANSION JOINT
0 20 40 60
SCALE 1"=20'

Project:
BELL POND PARK IMPROVEMENTS
WORCESTER, MA

196 BELMONT ST.
WORCESTER, MA 01605

Weston & Sampson
Weston & Sampson Engineers, Inc.
427 Main Street, Suite 400
Worcester, MA 01608
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:
NAULT ARCHITECTS INC.
71 Hope Avenue,
Worcester, MA 01603
508.755.6134
admin@naultarchitects.com

Revisions:

No.	Date	Description

COA:

Seal:

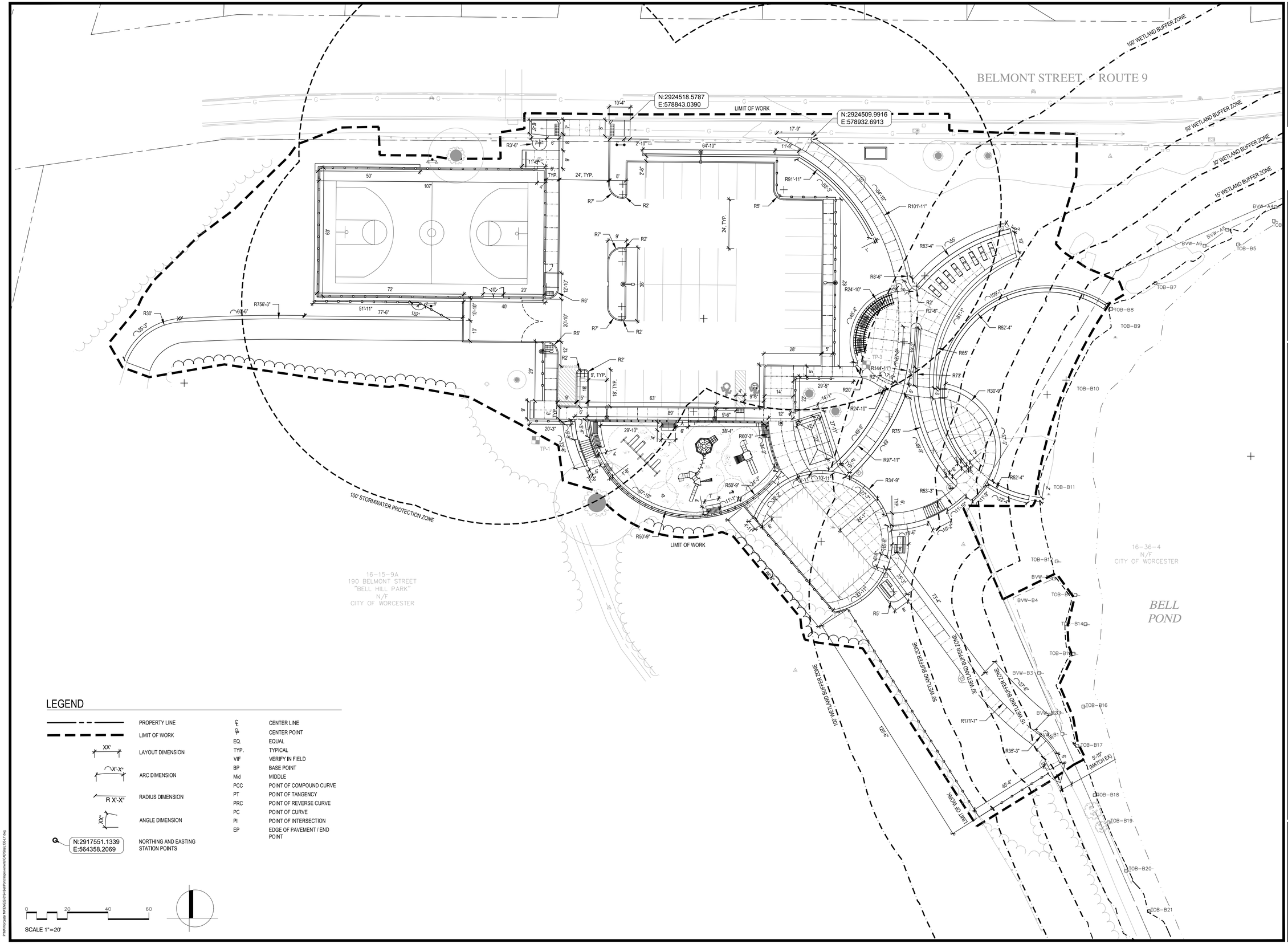
Issued For:
PERMIT SET
-NOT FOR CONSTRUCTION-

Scale: AS SHOWN

Date: March 22, 2023
Drawn By: TZ
Reviewed By: MS
Approved By: BK
W&S Project No.: ENG22-0194
W&S File No.:

Drawing Title:
MATERIALS PLAN

Sheet Number:
L120



LEGEND

PROPERTY LINE	
LIMIT OF WORK	
XX'	LAYOUT DIMENSION
X'-X"	ARC DIMENSION
R X'-X"	RADIUS DIMENSION
XX°	ANGLE DIMENSION
N:2917551.1339 E:564358.2069	NORTHING AND EASTING STATION POINTS

℄	CENTER LINE
℄	CENTER POINT
EQ.	EQUAL
TYP.	TYPICAL
VIF	VERIFY IN FIELD
BP	BASE POINT
Mid	MIDDLE
PCC	POINT OF COMPOUND CURVE
PT	POINT OF TANGENCY
PRC	POINT OF REVERSE CURVE
PC	POINT OF CURVE
PI	POINT OF INTERSECTION
EP	EDGE OF PAVEMENT / END POINT

0 20 40 60

SCALE 1"=20'

P:\MA\Worcester MA\ENG22\0194-BellPond Improvements\CAD\Sht L130-V1.dwg

Project:
BELL POND PARK IMPROVEMENTS
WORCESTER, MA

196 BELMONT ST,
WORCESTER, MA 01605

Weston & Sampson

Weston & Sampson Engineers, Inc.
427 Main Street, Suite 400
Worcester, MA 01608
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:
NAULT ARCHITECTS INC.
71 Hope Avenue,
Worcester, MA 01603
508.755.6134
admin@naultarchitects.com

Revisions:

No.	Date	Description

COA:

Seal:
MASSACHUSETTS
Stephen McKenna
REGISTERED PROFESSIONAL ENGINEER
No. 45401
LANDSCAPE ARCHITECT

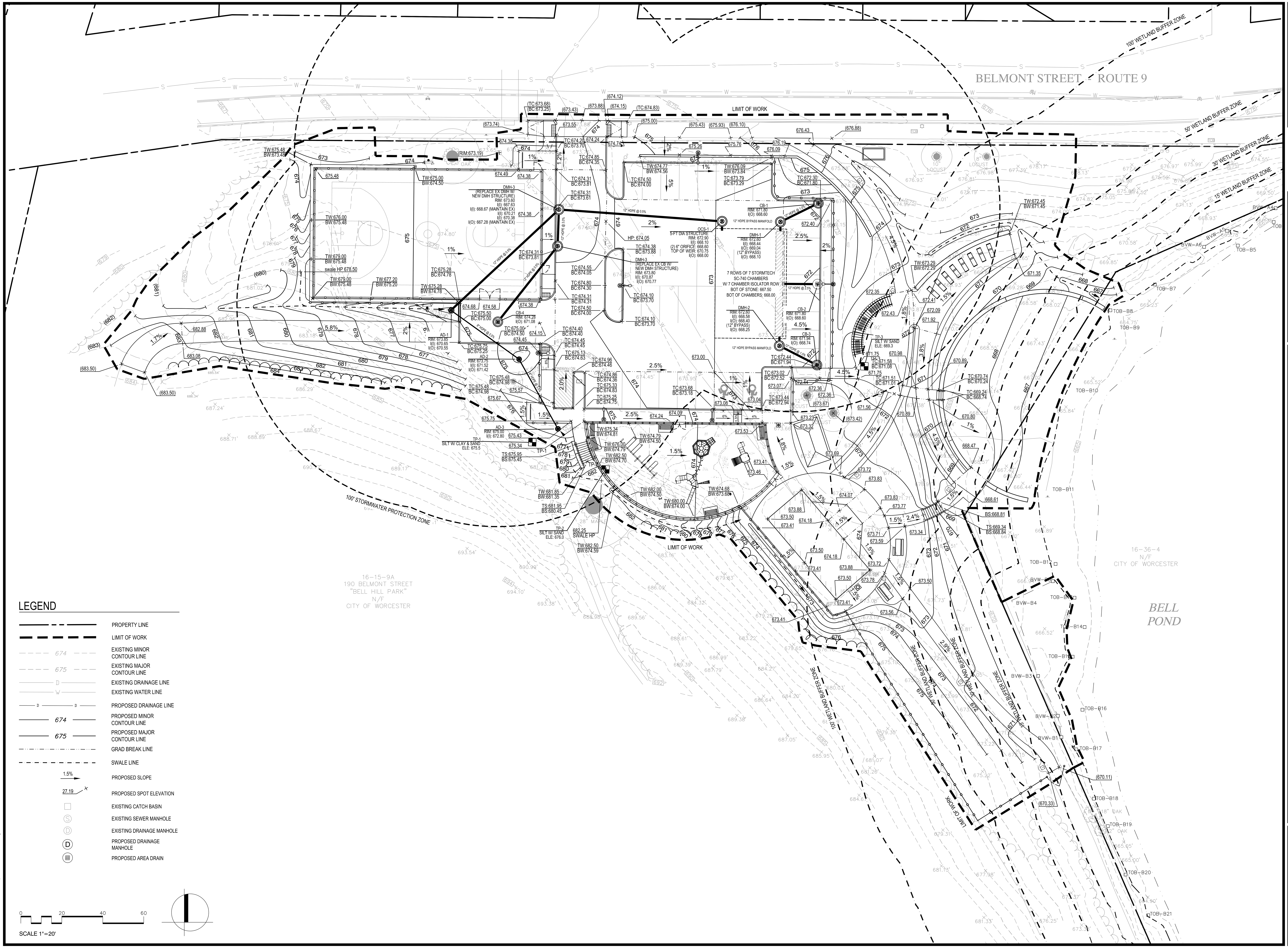
Issued For:
PERMIT SET
-NOT FOR CONSTRUCTION-

Scale: AS SHOWN

Date:	March 22, 2023
Drawn By:	TZ
Reviewed By:	MS
Approved By:	BK
W&S Project No.:	ENG22-0194
W&S File No.:	

Drawing Title:
LAYOUT
PLAN

Sheet Number:
L130



LEGEND

- PROPERTY LINE
- LIMIT OF WORK
- EXISTING MINOR CONTOUR LINE (674)
- EXISTING MAJOR CONTOUR LINE (675)
- EXISTING DRAINAGE LINE
- EXISTING WATER LINE
- PROPOSED DRAINAGE LINE
- PROPOSED MINOR CONTOUR LINE (674)
- PROPOSED MAJOR CONTOUR LINE (675)
- GRAD BREAK LINE
- SWALE LINE
- PROPOSED SLOPE (1.5%)
- PROPOSED SPOT ELEVATION (27.19)
- EXISTING CATCH BASIN
- EXISTING SEWER MANHOLE
- EXISTING DRAINAGE MANHOLE
- PROPOSED DRAINAGE MANHOLE
- PROPOSED AREA DRAIN

Project:
BELL POND PARK IMPROVEMENTS
WORCESTER, MA

196 BELMONT ST.
WORCESTER, MA 01605

Weston & Sampson
Weston & Sampson Engineers, Inc.
427 Main Street, Suite 400
Worcester, MA 01608
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:
NAULT ARCHITECTS INC.
71 Hope Avenue,
Worcester, MA 01603
508.755.6134
admin@naultarchitects.com

Revisions:

No.	Date	Description

COA:

Seal:

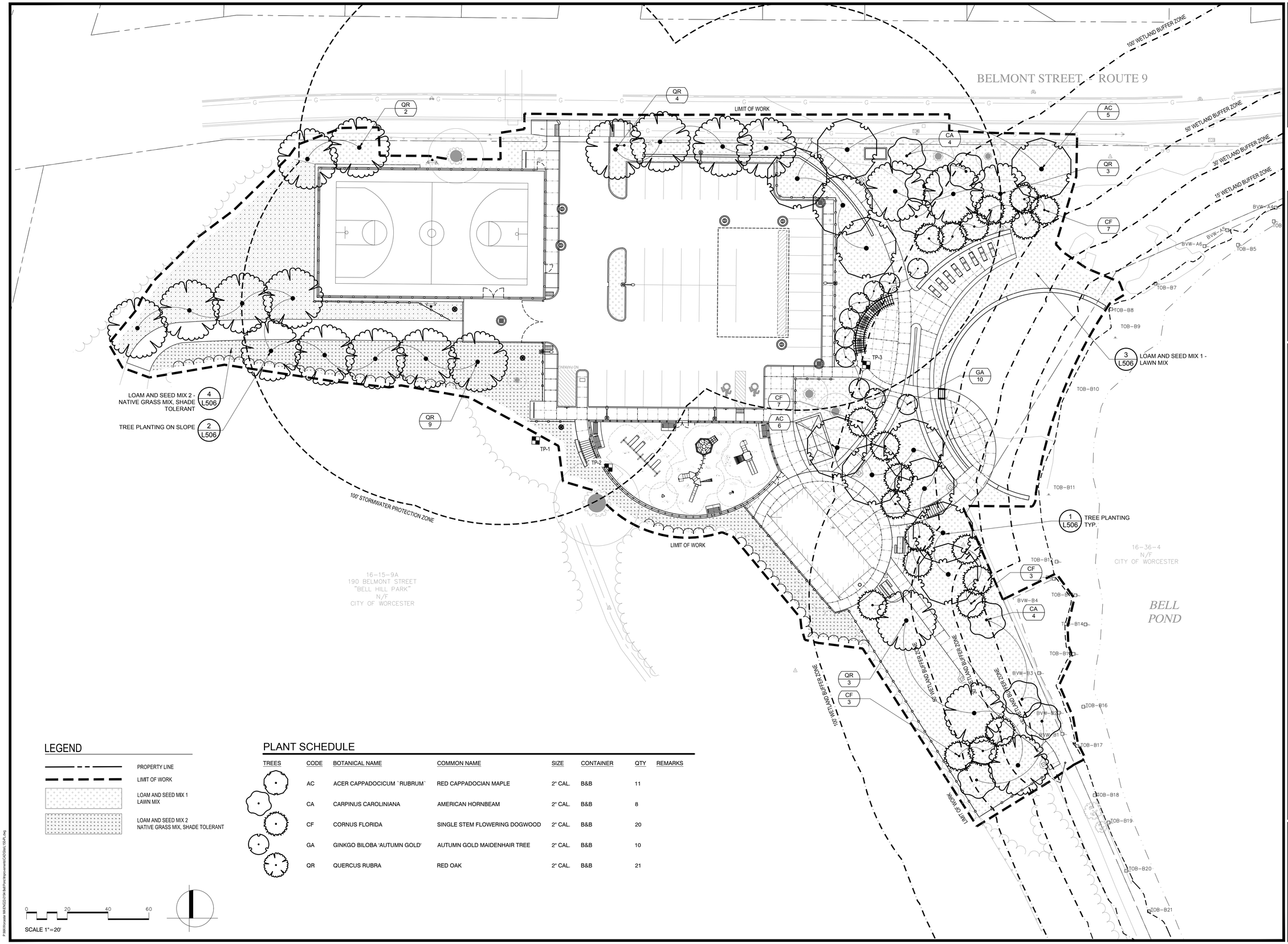
Issued For:
PERMIT SET
-NOT FOR CONSTRUCTION-

Scale: AS SHOWN

Date:	March 22, 2023
Drawn By:	TZ
Reviewed By:	MS
Approved By:	BK
W&S Project No.:	ENG22-0194
W&S File No.:	

Drawing Title:
GRADING & DRAINAGE PLAN

Sheet Number:
L140



LEGEND

- PROPERTY LINE
- LIMIT OF WORK
- LOAM AND SEED MIX 1 LAWN MIX
- LOAM AND SEED MIX 2 NATIVE GRASS MIX, SHADE TOLERANT

PLANT SCHEDULE

TREES	CODE	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER	QTY	REMARKS
	AC	ACER CAPPADOCICUM `RUBRUM`	RED CAPPADOCIAN MAPLE	2" CAL.	B&B	11	
	CA	CARPINUS CAROLINIANA	AMERICAN HORNBEAM	2" CAL.	B&B	8	
	CF	CORNUS FLORIDA	SINGLE STEM FLOWERING DOGWOOD	2" CAL.	B&B	20	
	GA	GINKGO BILOBA 'AUTUMN GOLD'	AUTUMN GOLD MAIDENHAIR TREE	2" CAL.	B&B	10	
	QR	QUERCUS RUBRA	RED OAK	2" CAL.	B&B	21	

0 20 40 60

SCALE 1"=20'

P:\MA\Worcester MA\ENG22\0194.Bell Pond Improvements\CAD\Sht\L150.dwg

Project:
BELL POND PARK IMPROVEMENTS
WORCESTER, MA

196 BELMONT ST.
WORCESTER, MA 01605

Weston & Sampson Engineers, Inc.
427 Main Street, Suite 400
Worcester, MA 01608
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:

NAULT ARCHITECTS INC.
71 Hope Avenue,
Worcester, MA 01603
508.755.6134
admin@naultarchitects.com

Revisions:

No.	Date	Description

COA:

Seal:

Issued For:
PERMIT SET
-NOT FOR CONSTRUCTION-

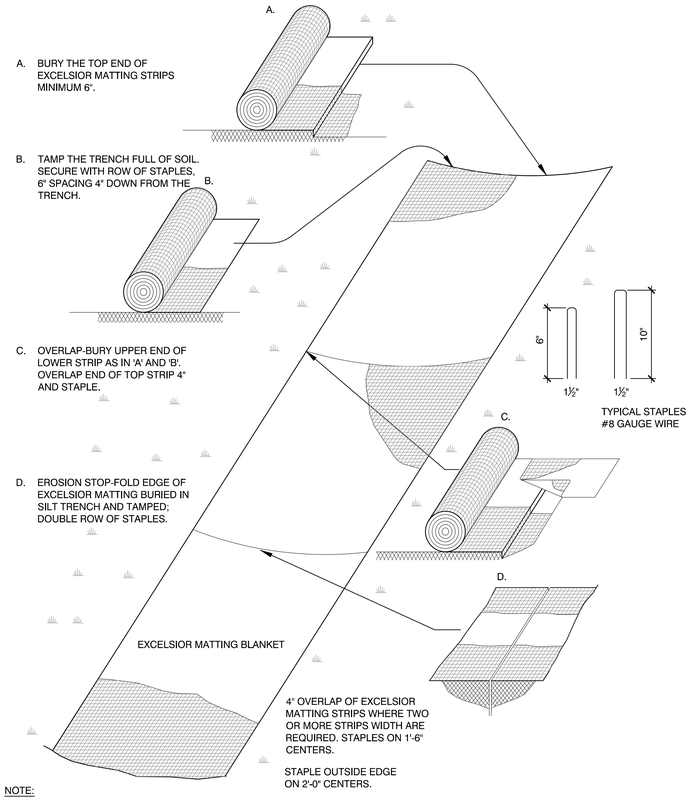
Scale: AS SHOWN

Date: March 22, 2023
Drawn By: TZ
Reviewed By: MS
Approved By: BK

W&S Project No.: ENG22-0194
W&S File No.:

Drawing Title:
PLANTING PLAN

Sheet Number:
L150



A. BURY THE TOP END OF EXCELSIOR MATTING STRIPS MINIMUM 6".

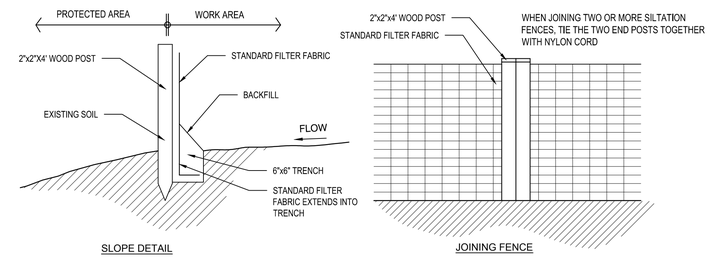
B. TAMP THE TRENCH FULL OF SOIL. SECURE WITH ROW OF STAPLES, 6" SPACING 4" DOWN FROM THE TRENCH.

C. OVERLAP-BURY UPPER END OF LOWER STRIP AS IN 'A' AND 'B'. OVERLAP END OF TOP STRIP 4" AND STAPLE.

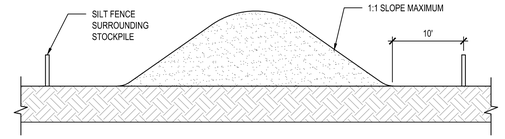
D. EROSION STOP-FOLD EDGE OF EXCELSIOR MATTING BURIED IN SILT TRENCH AND TAMPED; DOUBLE ROW OF STAPLES.

NOTE:
1. JUTE NETTING TO BE USED ON ALL SLOPES GREATER THAN 4H:1V AS INDICATED ON GRADING PLANS

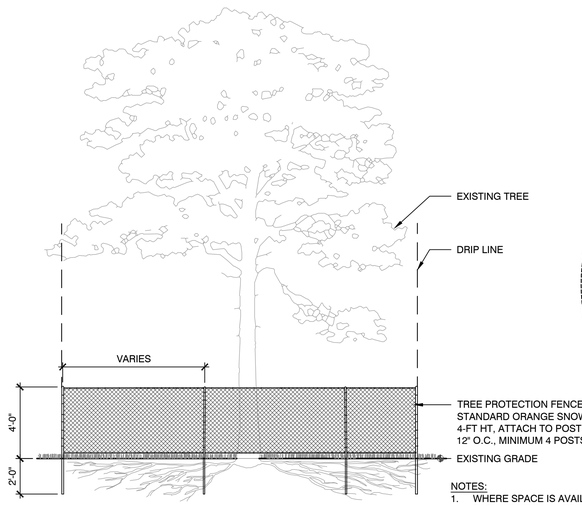
1 EROSION CONTROL BLANKET
NOT TO SCALE

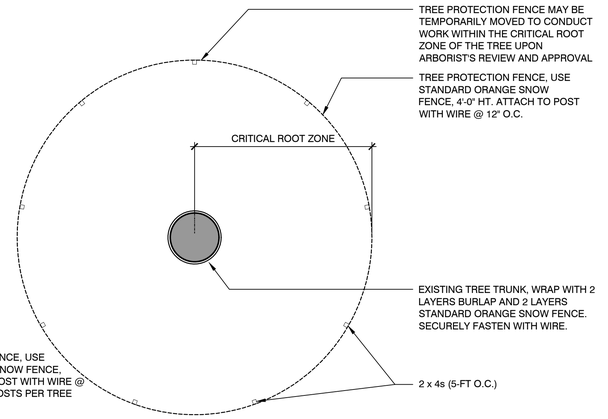


2 SILT FENCE, TYP.
NOT TO SCALE — MA-WO-BEL-69



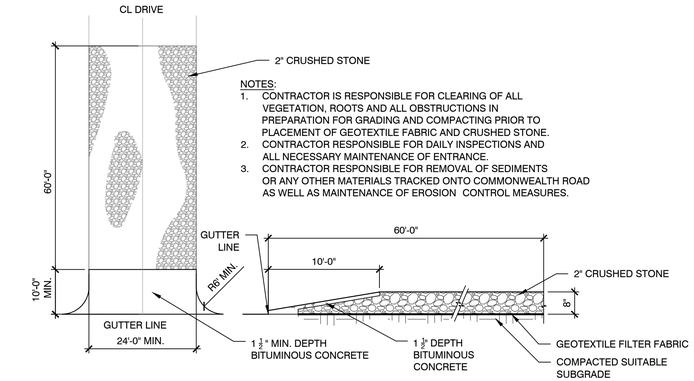
3 TOPSOIL STOCK PILE
NOT TO SCALE — MA-WO-BEL-70





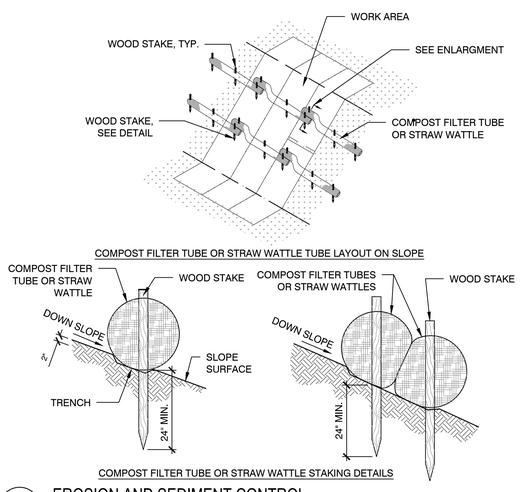
NOTES:
1. WHERE SPACE IS AVAILABLE, TREE PROTECTION FENCE TO BE PLACED A MINIMUM OF 10' FROM BASE OF TREE PLUS AN ADDITIONAL 1' FOR EACH ADDITIONAL DBH FOR TREES GREATER THAN 10" DBH (DIA. AT BREAST HT.)
2. ALL WORK DONE WITHIN TREE PROTECTION FENCE IS TO BE DONE BY HAND AND LIGHT EQUIPMENT.
3. ROOTS EXPOSED DURING EXCAVATION SHALL BE NEATLY CUT AND COVERED WITH SOIL IMMEDIATELY.
4. FOR TREES THAT OCCUR IN GROUPS PROVIDE TREE PROTECTION FENCE AROUND ENTIRE AREA. SEE PLAN FOR LOCATIONS.
5. MAINTAIN FENCE PROTECTION IN SOUND CONDITION UNTIL FENCE COMPLETION
6. A CERTIFIED ARBORIST SHALL DELINEATE LIMIT OF TREE PROTECTION FENCE AS THEY RELATE TO THE LIMITS OF THE CRITICAL ROOT ZONE.

4 TREE PROTECTION, TYP.
NOT TO SCALE

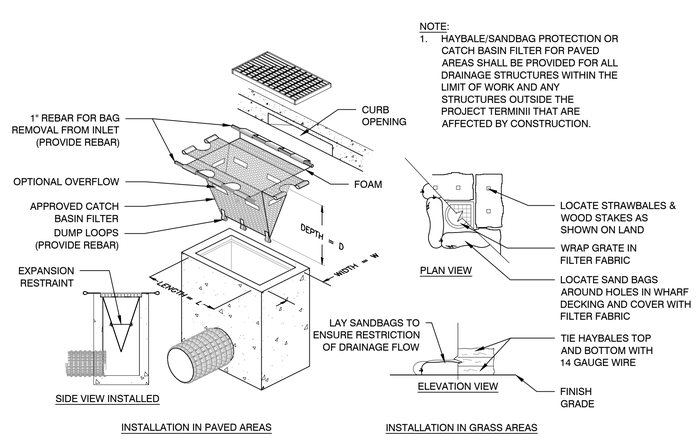


NOTES:
1. CONTRACTOR IS RESPONSIBLE FOR CLEARING OF ALL VEGETATION, ROOTS AND ALL OBSTRUCTIONS IN PREPARATION FOR GRADING AND COMPACTING PRIOR TO PLACEMENT OF GEOTEXTILE FABRIC AND CRUSHED STONE.
2. CONTRACTOR RESPONSIBLE FOR DAILY INSPECTIONS AND ALL NECESSARY MAINTENANCE OF ENTRANCE.
3. CONTRACTOR RESPONSIBLE FOR REMOVAL OF SEDIMENTS OR ANY OTHER MATERIALS TRACKED ONTO COMMONWEALTH ROAD AS WELL AS MAINTENANCE OF EROSION CONTROL MEASURES.

5 CONSTRUCTION ENTRANCE
NOT TO SCALE



6 EROSION AND SEDIMENT CONTROL
NOT TO SCALE



7 INLET SEDIMENT CONTROL
NOT TO SCALE

Project:
BELL POND PARK IMPROVEMENTS
WORCESTER, MA

196 BELMONT ST,
WORCESTER, MA 01605

Weston & Sampson
Weston & Sampson Engineers, Inc.
427 Main Street, Suite 400
Worcester, MA 01608
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:
NAULT ARCHITECTS INC.
71 Hope Avenue,
Worcester, MA 01603
508.755.6134
admin@naultarchitects.com

Revisions:

No.	Date	Description

COA:

Seal:
MASSACHUSETTS — Brandon Mikander — No. 40401 — REGISTERED LANDSCAPE ARCHITECT

Issued For:
PERMIT SET
-NOT FOR CONSTRUCTION-

Scale: AS SHOWN

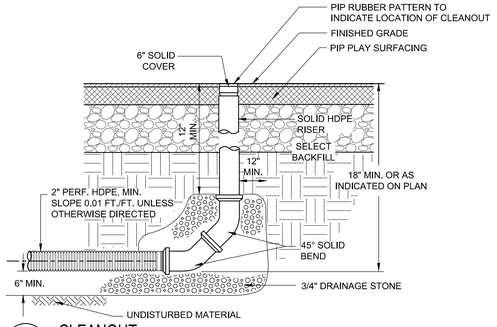
Date: March 22, 2023
Drawn By: TZ
Reviewed By: MS
Approved By: BK

W&S Project No.: ENG22-0194
W&S File No.:

Drawing Title:
CONSTRUCTION DETAILS

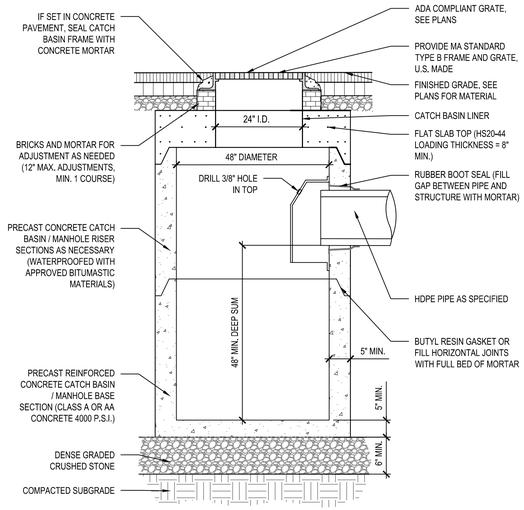
Sheet Number:
L500

P:\MA\Worcester MA\ENG22\0194.Bell Pond Improvements\CAD\Sht\L500.DGT.dwg



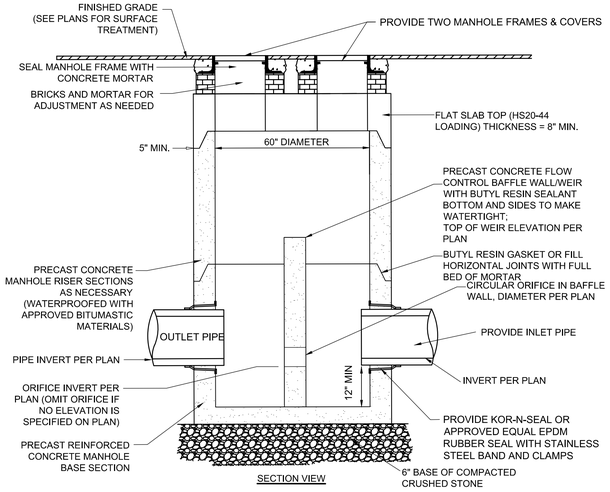
1 CLEANOUT

NOT TO SCALE



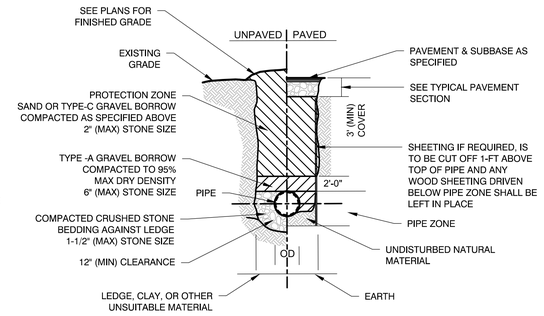
2 CATCH BASIN

NOT TO SCALE



3 OUTLET CONTROL STRUCTURE (OCS)

NOT TO SCALE

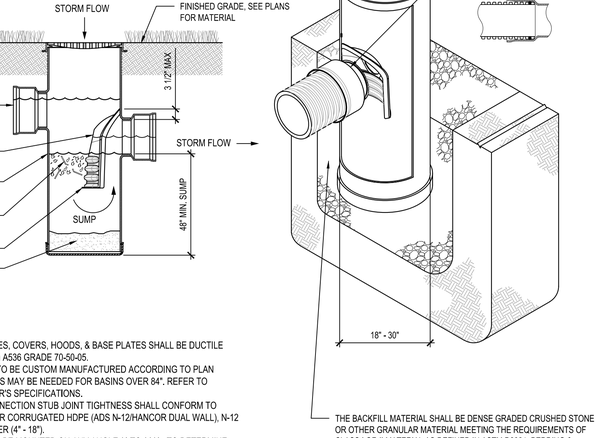


NOTES:

1. GRAVEL BORROW SHALL CONFORM TO MASSDOT SPECIFICATION M1.030
2. CRUSHED STONE BEDDING SHALL CONFORM TO MASSDOT SPECIFICATION M2.01.1

4 DRAIN TRENCH

NOT TO SCALE

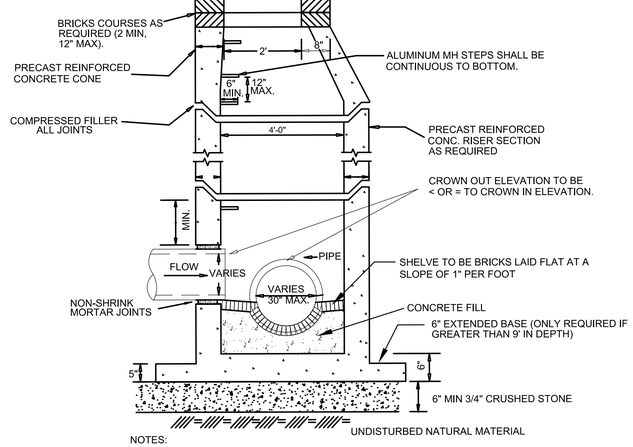


NOTES:

1. FRAMES, GRATES, COVERS, HOODS, & BASE PLATES SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05.
2. DRAIN BASINS TO BE CUSTOM MANUFACTURED ACCORDING TO PLAN DETAILS. RISERS MAY BE NEEDED FOR BASINS OVER 84". REFER TO MANUFACTURER'S SPECIFICATIONS.
3. DRAINAGE CONNECTION STUB JOINT TIGHTNESS SHALL CONFORM TO ASTM D3212 FOR CORRUGATED HDPE (ADS N-12/HANCOR DUAL WALL), N-12 HP, & PVC SEWER (4" - 18").
4. ADAPTERS CAN BE MOUNTED ON ANY ANGLE 0° TO 360°. TO DETERMINE MINIMUM ANGLE BETWEEN ADAPTERS, REFER TO MANUFACTURER'S SPECIFICATIONS.
5. BEEHIVE GRATES TO BE USED FOR YARD DRAINS IN LAWN AREAS.

5 AREA DRAIN

NOT TO SCALE



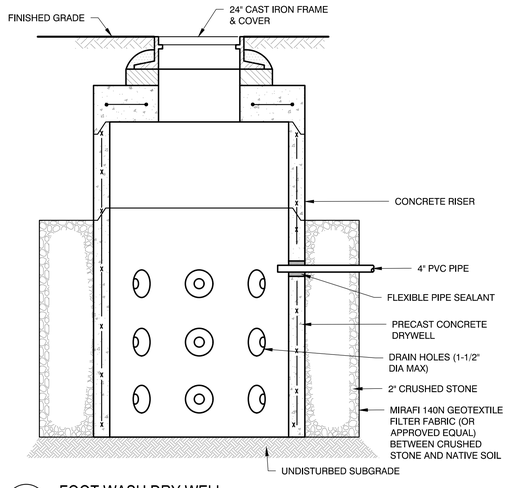
NOTES:

1, PIPE INVERTS SHALL DROP AT LEAST 0.1' ACROSS MANHOLES.

2, PIPE INVERTS SHALL BE INVERTED ARCH WITH BRICKS LAID AS STRECHERS AND ON EDGE.

6 PRECAST CONCRETE DRAIN MANHOLE

NOT TO SCALE



7 FOOT WASH DRY WELL

NOT TO SCALE

Project:
BELL POND PARK IMPROVEMENTS
WORCESTER, MA

196 BELMONT ST.
WORCESTER, MA 01605

Weston & Sampson Engineers, Inc.
427 Main Street, Suite 400
Worcester, MA 01608
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:
NAULT ARCHITECTS INC.
71 Hope Avenue,
Worcester, MA 01603
508.755.6134
admin@naultarchitects.com

Revisions:

No.	Date	Description

COA:

Seal:

Issued For:
PERMIT SET
-NOT FOR CONSTRUCTION-

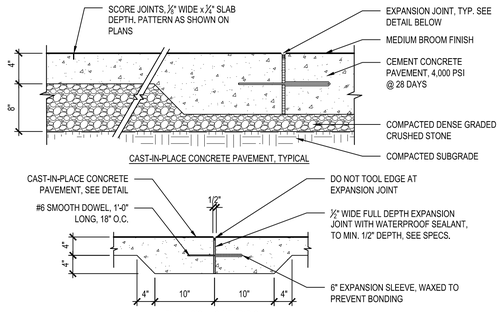
Scale: AS SHOWN

Date:	March 22, 2023
Drawn By:	TZ
Reviewed By:	MS
Approved By:	BK
W&S Project No.:	ENG22-0194
W&S File No.:	

Drawing Title:
CONSTRUCTION DETAILS

Sheet Number:
L501

P:\MA Worcester\ MA\ENG22-0194 Bell Pond Improvements\CAD\Sht\L000.DT dwg

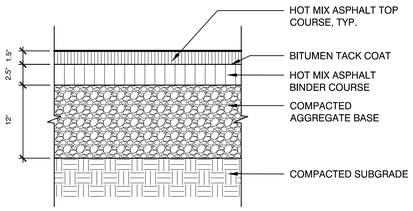


EXPANSION JOINT INSTALLATION NOTES:

1. DOWEL IS TYPICAL AT ALL EXPANSION JOINTS (18" O.C.) WITHIN CONCRETE PAVING AND BETWEEN NEW CONCRETE PAVING AND EXISTING CONCRETE PAVING TO REMAIN.
2. DELETE EXPANSION SLEEVE AND DOWEL WHERE JOINT ABUTS WALL, CURBS, OR OTHER VERTICAL SURFACES, UNLESS OTHERWISE NOTED.
3. EXPANSION JOINTS MAX. 25'-0" O.C. UNLESS SHOWN OTHERWISE.
4. EXPANSIONS JOINTS SHALL BE PLACED WHERE NEW CEMENT CONCRETE PAVEMENT MEETS EXISTING PAVEMENT OR WALLS TO REMAIN.
5. ALL EXPANSION JOINTS SHALL BE SAW CUT.

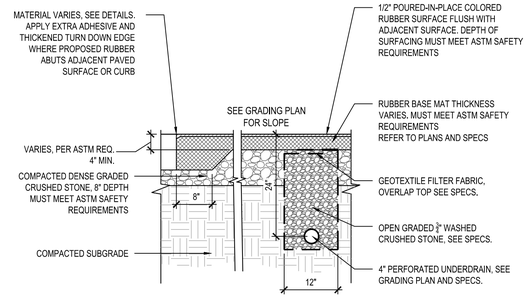
1 CIP CONCRETE PAVEMENT AND EXPANSION JOINT

NOT TO SCALE



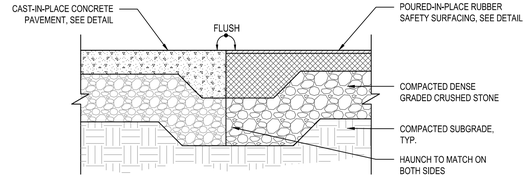
2 HOT MIX ASPHALT PAVEMENT-VEHICULAR, TYP.

NOT TO SCALE



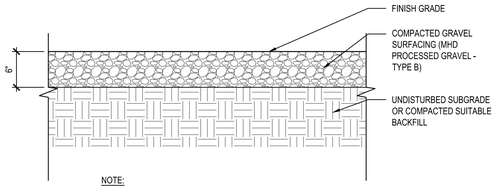
3 POURED-IN-PLACE RUBBER SAFETY SURFACING, TYP.

NOT TO SCALE



4 POURED-IN-PLACE RUBBER SURFACING AT CIP CONCRETE PAVING

NOT TO SCALE

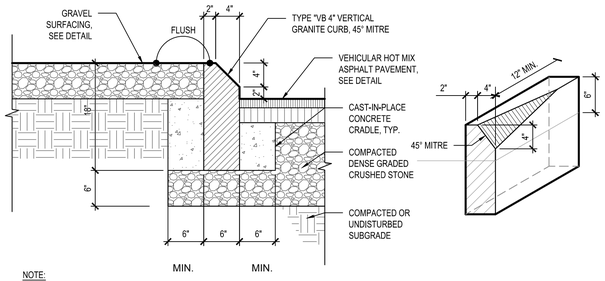


NOTE:

1. PITCH OF PATH VARIES, TO MATCH EXISTING CONTOURS

5 GRAVEL SURFACING

NOT TO SCALE

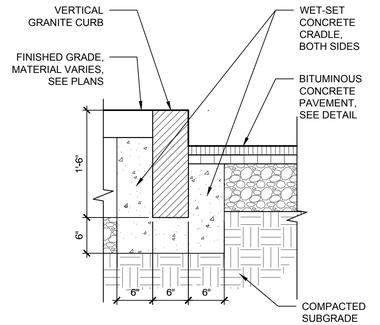


NOTE:

1. CONCRETE CRADLE SHALL ABUT THE BOTTOM OF THE VEHICULAR HOT MIX ASPHALT PAVEMENT TOP COURSE.

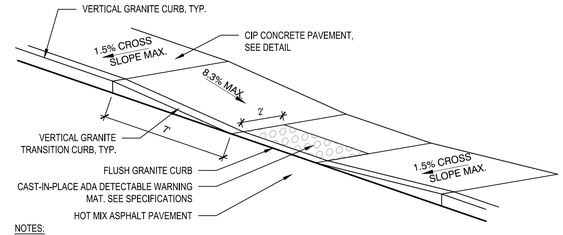
6 MOUNTABLE CURB

NOT TO SCALE



7 VERTICAL GRANITE CURB

NOT TO SCALE

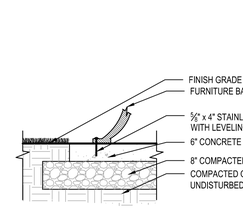


NOTES:

1. CONTRACTOR SHALL PROVIDE CLEAN AND STRAIGHT SAWCUT LINES AT LIMIT OF REMOVAL OF EXISTING ASPHALT PAVEMENT TO REMAIN. CONTRACTOR SHALL VERIFY LIMITS OF EXISTING ASPHALT PAVEMENT REMOVAL PRIOR TO COMMENCING DEMOLITION.
2. CONTRACTOR SHALL REMOVE AND REPLACE BITUMINOUS CONCRETE PAVEMENT, DENSE GRADE CRUSHED STONE, GRAVEL BORROW, AND SUBGRADE NECESSARY TO CONSTRUCT A CLEAN, SMOOTH TRANSITION WHERE IT ABUTS EXISTING CONDITIONS.

8 ADA CURB CUT, TYPE A

NOT TO SCALE

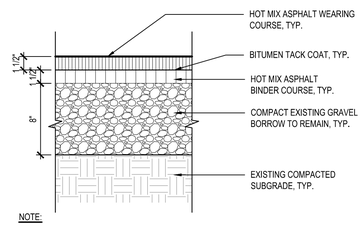


NOTE:

1. ALL SITE FURNISHINGS SHALL BE SURFACE MOUNTED PER MANUFACTURER'S RECOMMENDATIONS.

9 FURNITURE SURFACE MOUNT, TYP.

NOT TO SCALE

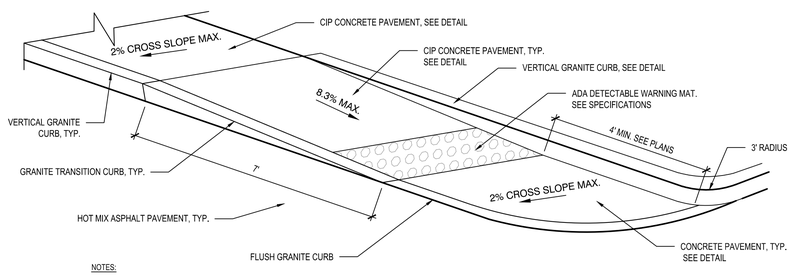


NOTE:

1. CONTRACTOR TO PROVIDE SMOOTH TRANSITION WHERE NEW PAVEMENT ABUTS EXISTING PAVEMENT, TYP.

10 HOT MIX ASPHALT PAVEMENT-COURT

NOT TO SCALE

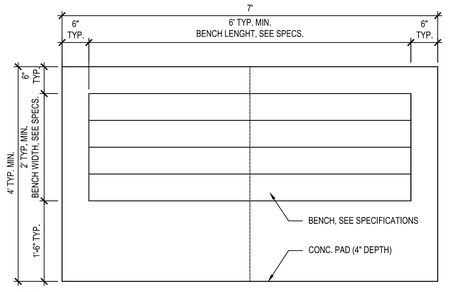


NOTES:

1. CONTRACTOR SHALL PROVIDE CLEAN AND STRAIGHT SAWCUT LINES AT LIMIT OF REMOVAL OF EXISTING BITUMINOUS CONCRETE PAVEMENT TO REMAIN AT ROADWAY. CONTRACTOR SHALL VERIFY LIMITS OF EXISTING ASPHALT PAVEMENT REMOVAL PRIOR TO COMMENCING DEMOLITION.
2. CONTRACTOR SHALL REMOVE AND REPLACE BITUMINOUS CONCRETE PAVEMENT, GRAVEL BORROW, AND SUBGRADE NECESSARY TO CONSTRUCT A CLEAN, SMOOTH TRANSITION AT ADA CURB CUT.

11 ADA CURB CUT TYPE B

NOT TO SCALE

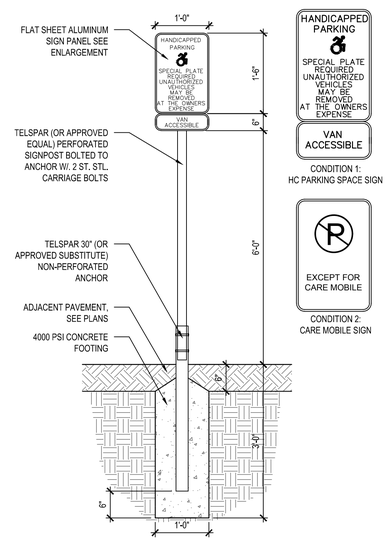


NOTES:

1. ALL SITE FURNISHINGS SHALL BE SURFACE MOUNTED PER MANUFACTURER'S RECOMMENDATIONS.
2. WHERE SITE FURNISHINGS AREA LOCATED ON CONCRETE PAVEMENT WITHOUT A DESIGNATED PAD, DEPTH OF CONCRETE IN THE AREA OF INSTALLATION SHALL BE 6' MIN.

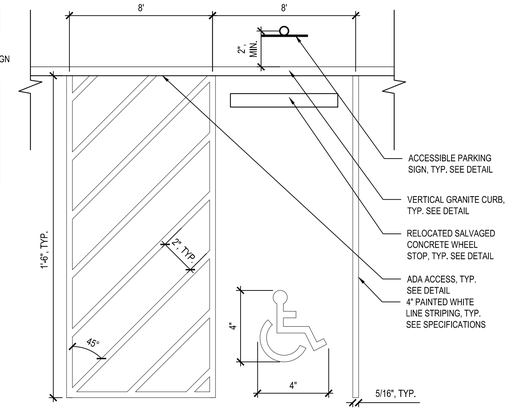
12 BENCH ON CONCRETE PAD

NOT TO SCALE



13 PARKING SPACE SIGN, TWO CONDITIONS

NOT TO SCALE



14 ACCESSIBLE PARKING SPACE MARKINGS

NOT TO SCALE

Project:
BELL POND PARK IMPROVEMENTS
WORCESTER, MA

196 BELMONT ST.
WORCESTER, MA 01605

Weston & Sampson

Weston & Sampson Engineers, Inc.
427 Main Street, Suite 400
Worcester, MA 01608
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:

NAULT ARCHITECTS INC.
71 Hope Avenue,
Worcester, MA 01603
508.755.6134
admin@naultarchitects.com

Revisions:

No.	Date	Description

COA:

Seal:

Issued For:

PERMIT SET
-NOT FOR CONSTRUCTION-

Scale:	AS SHOWN
Date:	March 22, 2023
Drawn By:	TZ
Reviewed By:	MS
Approved By:	BK
W&S Project No.:	ENG22-0194
W&S File No.:	

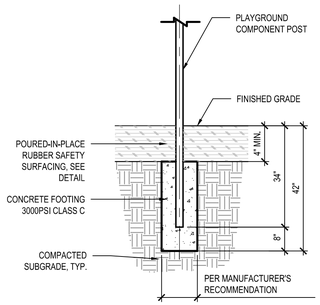
Drawing Title:

CONSTRUCTION DETAILS

Sheet Number:

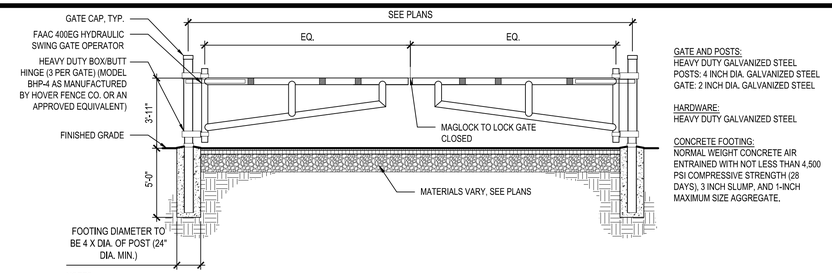
L502

P:\Mill\Worcester Mill\ENG22-0194 Bell Pond Improvements\CAD\Sheet\L502.dwg



1 PLAYGROUND POST FOOTING

NOT TO SCALE



GATE AND POSTS:
HEAVY DUTY GALVANIZED STEEL POSTS: 4 INCH DIA. GALVANIZED STEEL GATE: 2 INCH DIA. GALVANIZED STEEL

HARDWARE:
HEAVY DUTY GALVANIZED STEEL

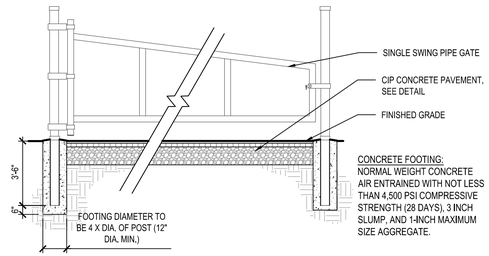
CONCRETE FOOTING:
NORMAL WEIGHT CONCRETE AIR ENTRAINED WITH NOT LESS THAN 4,500 PSI COMPRESSIVE STRENGTH (28 DAYS), 3 INCH SLUMP, AND 1-INCH MAXIMUM SIZE AGGREGATE.

NOTES:

1. THE CONTRACTOR SHALL PROVIDE ALL GATE COMPONENTS, HARDWARE, ETC. FOR THE COMPLETE INSTALLATION OF THE NEW GATE. INSTALL IN STRICT COMPLIANCE WITH THE MANUFACTURER'S WRITTEN RECOMMENDATIONS AND SPECIFICATIONS. ALL MATERIALS SHALL BE HEAVY DUTY RATED AND APPROVED BY THE ENGINEER PRIOR TO INSTALLATION. ALL HARDWARE SHALL INSTALLED SO THAT THE GATE IS STRUCTURALLY SOUND AND DOES NOT SAG IN THE OPEN AND/OR CLOSED POSITION. COORDINATE LAYOUT AND LOCATION IN THE FIELD WITH THE ENGINEER PRIOR TO INSTALLATION.
2. GRIND ALL WELDS SMOOTH. GALVANIZE AFTER FABRICATION. NO ON SITE WELDS.
3. PROVIDE REFLECTIVE STICKERS ON ALL VERTICAL AND HORIZONTAL GATE MEMBERS
4. CONTRACTOR SHALL SUBMIT SHOP DRAWING OF GATES FOR APPROVAL SHOWING ALL COMPONENTS.

2 HEAVY DUTY DOUBLE SWING PIPE GATE

NOT TO SCALE



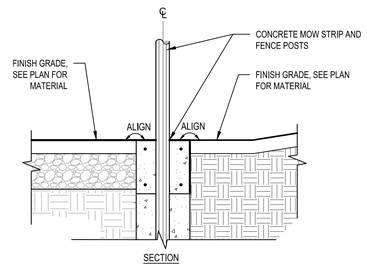
CONCRETE FOOTING:
NORMAL WEIGHT CONCRETE AIR ENTRAINED WITH NOT LESS THAN 4,500 PSI COMPRESSIVE STRENGTH (28 DAYS), 3 INCH SLUMP, AND 1-INCH MAXIMUM SIZE AGGREGATE.

NOTE:

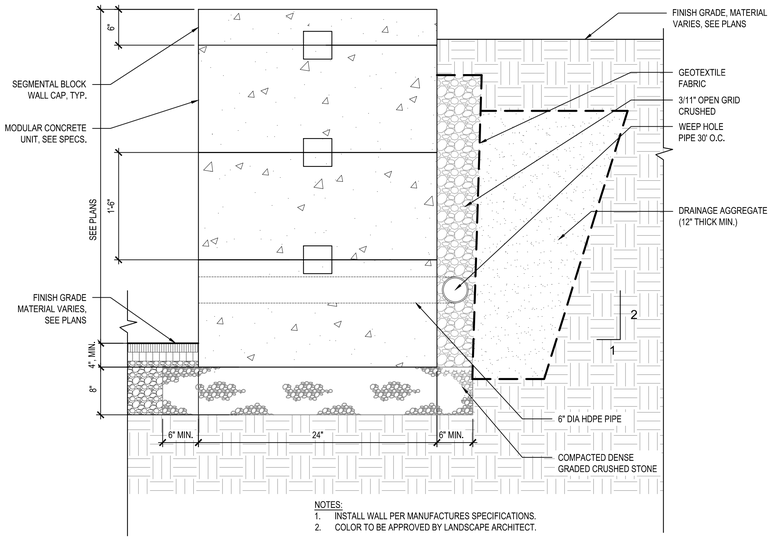
1. A HITCH POST FOR THE GATE ALONG WITH A CONCRETE FOOTING FOR THE HITCH POST SHALL ALSO BE INSTALLED WITH THE METAL SWING GATE.

3 SINGLE SWING PIPE GATE

NOT TO SCALE



SECTION

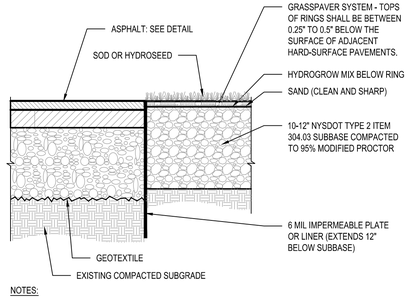


NOTES:

1. INSTALL WALL PER MANUFACTURES SPECIFICATIONS.
2. COLOR TO BE APPROVED BY LANDSCAPE ARCHITECT.

4 UNIT BLOCK RETAINING WALL

NOT TO SCALE



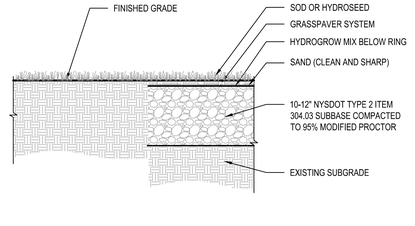
NOTES:

1. GRASSPAVER SYSTEM TO BE GRASSPAVE2 SYSTEM AS MANUFACTURER BY INVISIBLE STRUCTURES, OR APPROVED EQUIVALENT.
2. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION.

ADJACENT TO ASPHALT PAVEMENT

5 GRASSPAVE SURFACING

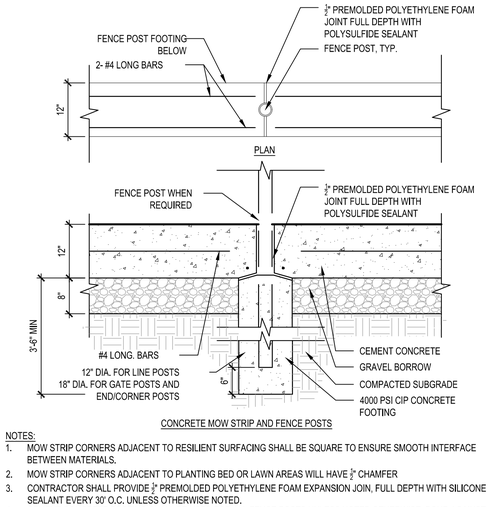
NOT TO SCALE



NOTES:

1. GRASSPAVER SYSTEM TO BE GRASSPAVE2 SYSTEM AS MANUFACTURER BY INVISIBLE STRUCTURES, OR APPROVED EQUIVALENT.
2. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION.

ADJACENT TO LAWN



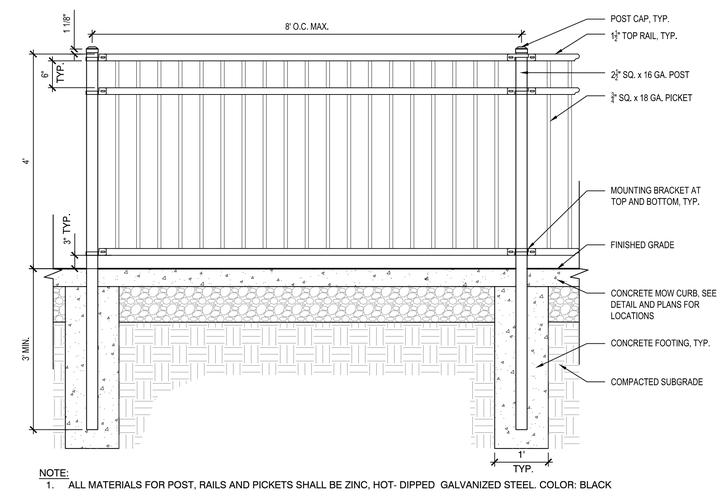
CONCRETE MOW STRIP AND FENCE POSTS

NOTES:

1. MOW STRIP CORNERS ADJACENT TO RESILIENT SURFACING SHALL BE SQUARE TO ENSURE SMOOTH INTERFACE BETWEEN MATERIALS.
2. MOW STRIP CORNERS ADJACENT TO PLANTING BED OR LAWN AREAS WILL HAVE ¾" CHAMFER
3. CONTRACTOR SHALL PROVIDE ¾" PREMOLDED POLYETHYLENE FOAM EXPANSION JOIN, FULL DEPTH WITH SILICONE SEALANT EVERY 30' O.C. UNLESS OTHERWISE NOTED.
4. CEMENT CONCRETE FOOTING SHALL BE USED FOR ALL FENCE POSTS UNLESS NOTED OTHERWISE. POUR AGAINST UNDISTURBED/COMPACTED SUBGRADE UNLESS OTHERWISE NOTED.
5. WHEN LOCATED IN PAVED AREAS, FENCES SHALL BE OFFSET 6" FROM THE EDGE OF CONCRETE AND 12" FROM THE EDGE OF BITUMINOUS CONCRETE.

6 MOW STRIP AND FENCE POST

NOT TO SCALE

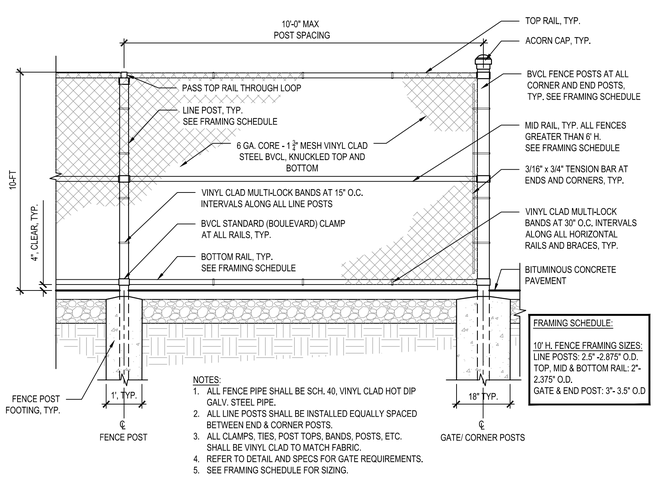


NOTE:

1. ALL MATERIALS FOR POST, RAILS AND PICKETS SHALL BE ZINC, HOT- DIPPED GALVANIZED STEEL. COLOR: BLACK

7 4' HT. ORNAMENTAL FENCE

NOT TO SCALE



FRAMING SCHEDULE:

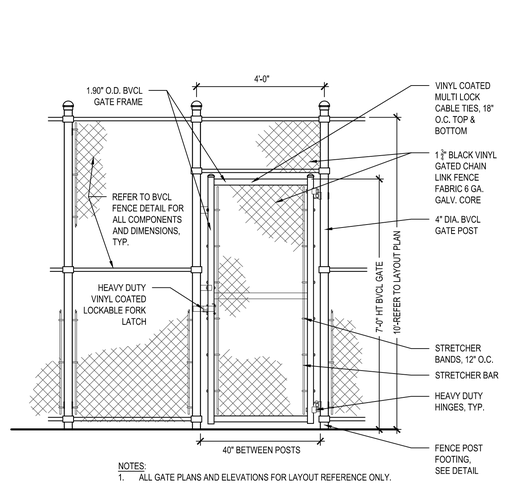
10' H. FENCE FRAMING SIZES:
LINE POSTS: 2.5"-2.875" O.D.
TOP, MID & BOTTOM RAIL: 2"-2.375" O.D.
GATE & END POST: 3"- 3.5" O.D

NOTES:

1. ALL FENCE PIPE SHALL BE SCH, 40, VINYL CLAD HOT DIP GALV. STEEL PIPE.
2. ALL LINE POSTS SHALL BE INSTALLED EQUALLY SPACED BETWEEN END & CORNER POSTS.
3. ALL CLAMPS, TIES, POST TOPS, BANDS, POSTS, ETC. SHALL BE VINYL CLAD TO MATCH FABRIC.
4. REFER TO DETAIL AND SPECS FOR GATE REQUIREMENTS.
5. SEE FRAMING SCHEDULE FOR SIZING.

8 10' HT. BVCL FENCE

NOT TO SCALE



NOTES:

1. ALL GATE PLANS AND ELEVATIONS FOR LAYOUT REFERENCE ONLY.

9 BVCL SINGLE GATE

NOT TO SCALE

Project:
BELL POND PARK IMPROVEMENTS
WORCESTER, MA

196 BELMONT ST.
WORCESTER, MA 01605

Weston & Sampson

Weston & Sampson Engineers, Inc.
427 Main Street, Suite 400
Worcester, MA 01608
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:

NAULT ARCHITECTS INC.
71 Hope Avenue,
Worcester, MA 01603
508.755.6134
admin@naultarchitects.com

Revisions:

No.	Date	Description

COA:

Seal:

Issued For:

PERMIT SET
-NOT FOR CONSTRUCTION-

Scale: AS SHOWN

Date: March 22, 2023
Drawn By: TZ
Reviewed By: MS
Approved By: BK

W&S Project No.: ENG22-0194
W&S File No.:

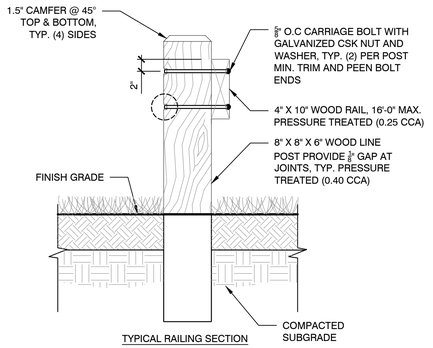
Drawing Title:

CONSTRUCTION DETAILS

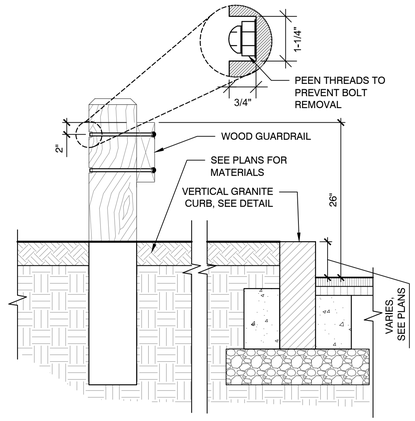
Sheet Number:

L503

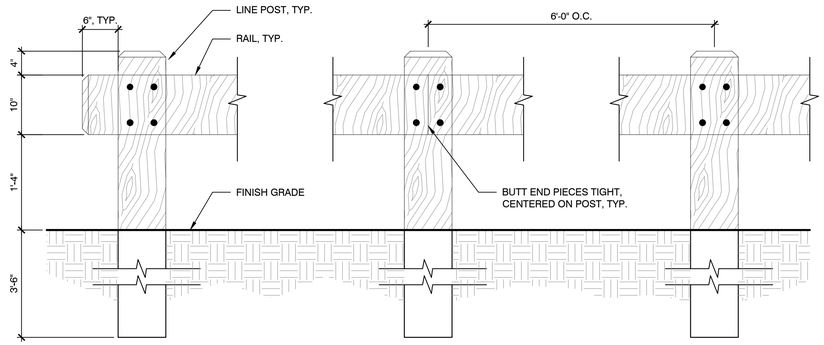
P:\Worcester Mass\ENG22-0194 Bell Pond Improvements\CAD\Sheets\L503.DGT dwg



TYPICAL RAILING SECTION



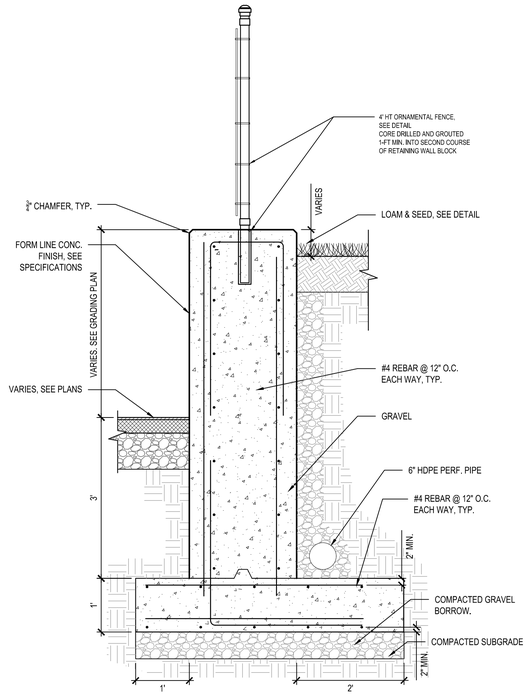
RAILING AT BACK OF CURB



TYPICAL RAILING ELEVATION

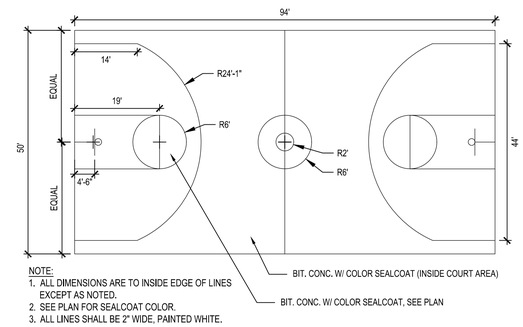
1 WOOD GUARDRAIL, TYP.

NOT TO SCALE



2 CIP CONCRETE RETAINING WALL WITH FENCE

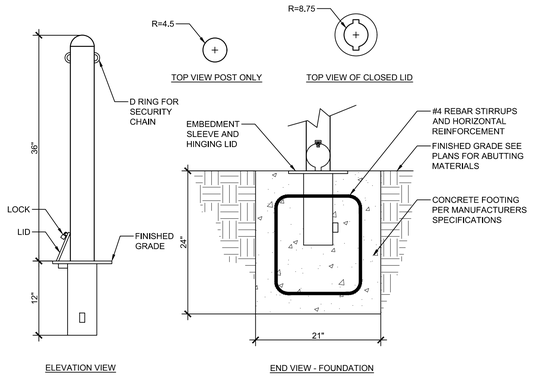
NOT TO SCALE



NOTE:
1. ALL DIMENSIONS ARE TO INSIDE EDGE OF LINES EXCEPT AS NOTED.
2. SEE PLAN FOR SEALCOAT COLOR.
3. ALL LINES SHALL BE 2" WIDE, PAINTED WHITE.

3 BASKETBALL COURT LAYOUT

NOT TO SCALE

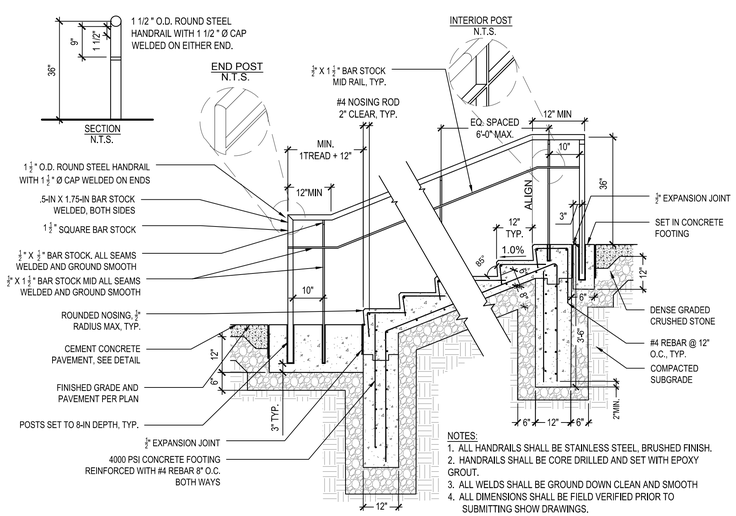


ELEVATION VIEW

END VIEW - FOUNDATION

4 REMOVABLE BOLLARD

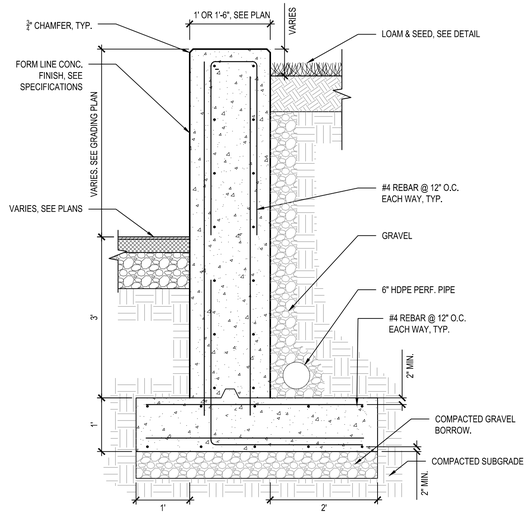
NOT TO SCALE



NOTES:
1. ALL HANDRAILS SHALL BE STAINLESS STEEL, BRUSHED FINISH.
2. HANDRAILS SHALL BE CORE DRILLED AND SET WITH EPOXY GROUT.
3. ALL WELDS SHALL BE GROUND DOWN CLEAN AND SMOOTH
4. ALL DIMENSIONS SHALL BE FIELD VERIFIED PRIOR TO SUBMITTING SHOW DRAWINGS.

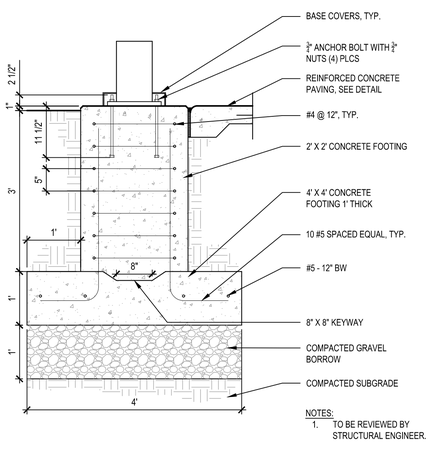
5 CIP CONCRETE STAIRS WITH PAINTED GALVANIZED STEEL HANDRAIL

NOT TO SCALE



6 CIP CONCRETE RETAINING WALL AT PLANTING

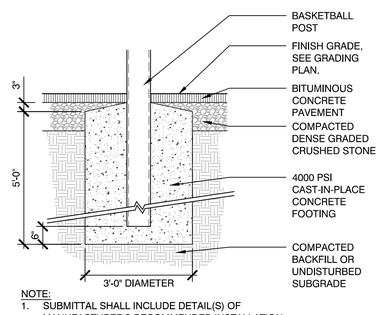
NOT TO SCALE



NOTES:
1. TO BE REVIEWED BY STRUCTURAL ENGINEER.

7 SHADE STRUCTURE & FOOTING

NOT TO SCALE



NOTE:
1. SUBMITTAL SHALL INCLUDE DETAIL(S) OF MANUFACTURER'S RECOMMENDED INSTALLATION.

8 BASKETBALL POST FOOTING

NOT TO SCALE

Project:
BELL POND PARK IMPROVEMENTS
WORCESTER, MA

196 BELMONT ST.
WORCESTER, MA 01605

Weston & Sampson

Weston & Sampson Engineers, Inc.
427 Main Street, Suite 400
Worcester, MA 01608
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:

NAULT ARCHITECTS INC.
71 Hope Avenue,
Worcester, MA 01603
508.755.6134
admin@naultarchitects.com

Revisions:

No.	Date	Description

COA:

Seal:

Issued For:

PERMIT SET
-NOT FOR CONSTRUCTION-

Scale: AS SHOWN

Date:	March 22, 2023
Drawn By:	TZ
Reviewed By:	MS
Approved By:	BK
W&S Project No.:	ENG22-0194
W&S File No.:	

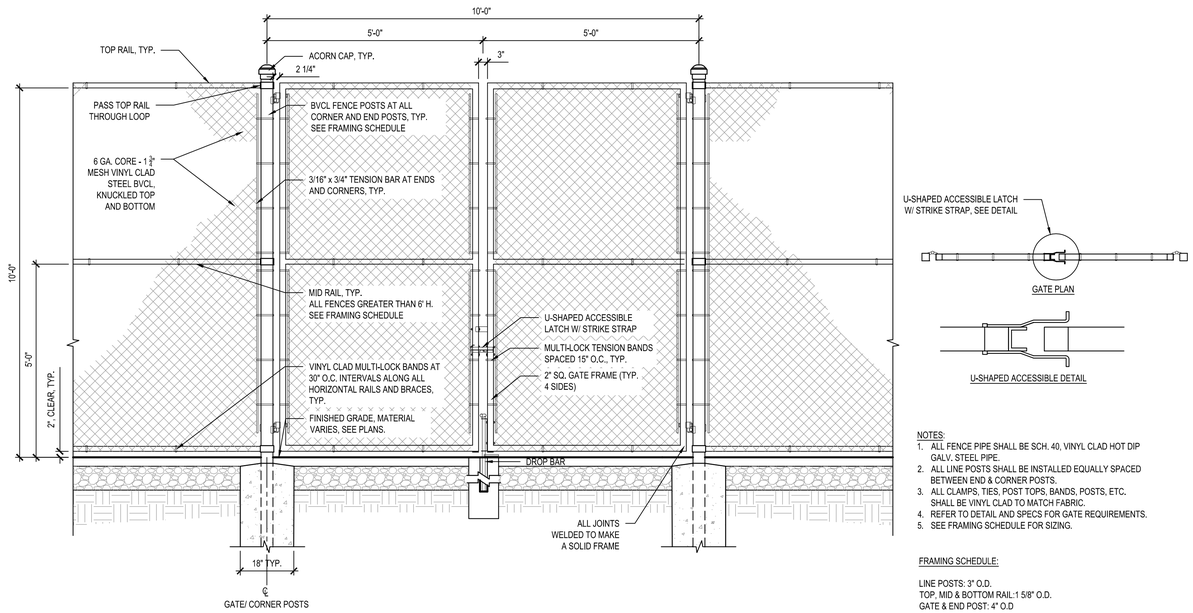
Drawing Title:

CONSTRUCTION DETAILS

Sheet Number:

L504

P:\MA\Worcester MA\ENG22-0194 Bell Pond Improvements\CAD\Sheet\L504.dwg



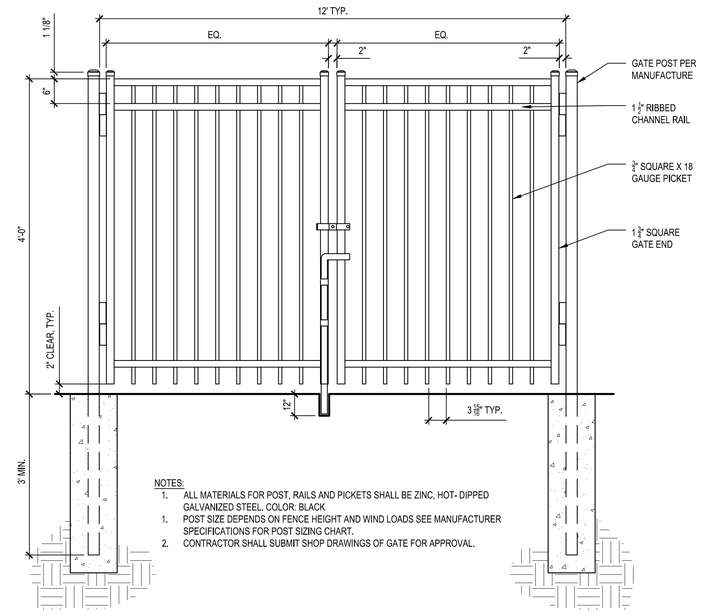
NOTES:
1. ALL FENCE PIPE SHALL BE SCH. 40, VINYL CLAD HOT DIP GALV. STEEL PIPE.
2. ALL LINE POSTS SHALL BE INSTALLED EQUALLY SPACED BETWEEN END & CORNER POSTS.
3. ALL CLAMPS, TIES, POST TOPS, BANDS, POSTS, ETC. SHALL BE VINYL CLAD TO MATCH FABRIC.
4. REFER TO DETAIL AND SPECS FOR GATE REQUIREMENTS.
5. SEE FRAMING SCHEDULE FOR SIZING.

FRAMING SCHEDULE:

LINE POSTS: 3" O.D.
TOP, MID & BOTTOM RAIL:1 5/8" O.D.
GATE & END POST: 4" O.D

1 10' WIDE BVCL DOUBLE SWING GATE

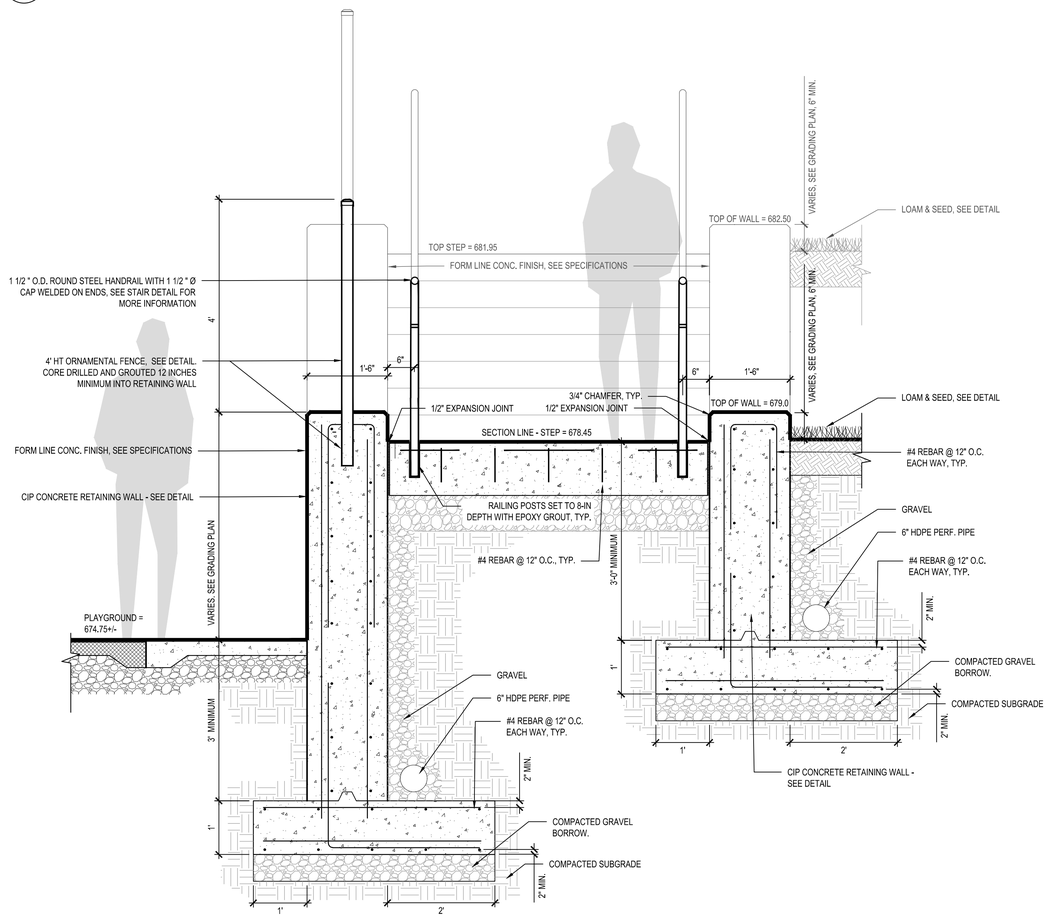
NOT TO SCALE



NOTES:
1. ALL MATERIALS FOR POST, RAILS AND PICKETS SHALL BE ZINC, HOT- DIPPED GALVANIZED STEEL. COLOR: BLACK
1. POST SIZE DEPENDS ON FENCE HEIGHT AND WIND LOADS SEE MANUFACTURER SPECIFICATIONS FOR POST SIZING CHART.
2. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS OF GATE FOR APPROVAL.

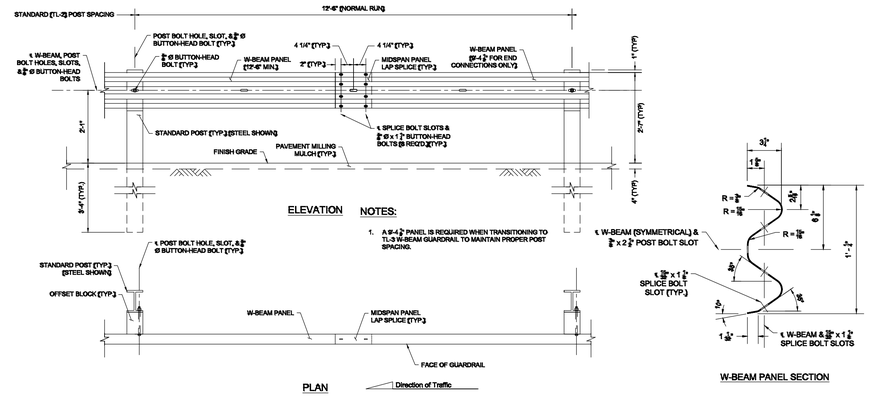
2 4' HT. ORNAMENTAL DOUBLE SWING GATE, TYP.

NOT TO SCALE



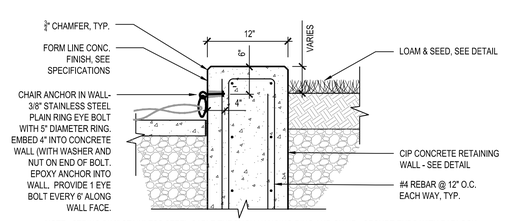
3 CIP CONCRETE STAIRS AT CIP CONCRETE RETAINING WALLS

NOT TO SCALE



4 METAL GUARDRAIL

NOT TO SCALE



NOTE: STRING 5/16" STAINLESS STEEL CABLE THROUGH HANGING RING AND CHAIR - SECURE ENDS WITH PADLOCK.

5 CHAIR CABLE ANCHOR

NOT TO SCALE

Project:
BELL POND PARK IMPROVEMENTS
WORCESTER, MA

196 BELMONT ST.
WORCESTER, MA 01605

Weston & Sampson Engineers, Inc.
427 Main Street, Suite 400
Worcester, MA 01608
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:
NAULT ARCHITECTS INC.
71 Hope Avenue,
Worcester, MA 01603
508.755.6134
admin@naultarchitects.com

Revisions:

No.	Date	Description

COA:

Seal:

Issued For:

PERMIT SET
-NOT FOR CONSTRUCTION-

Scale:	AS SHOWN
Date:	March 22, 2023
Drawn By:	TZ
Reviewed By:	MS
Approved By:	BK
W&S Project No.:	ENG22-0194
W&S File No.:	

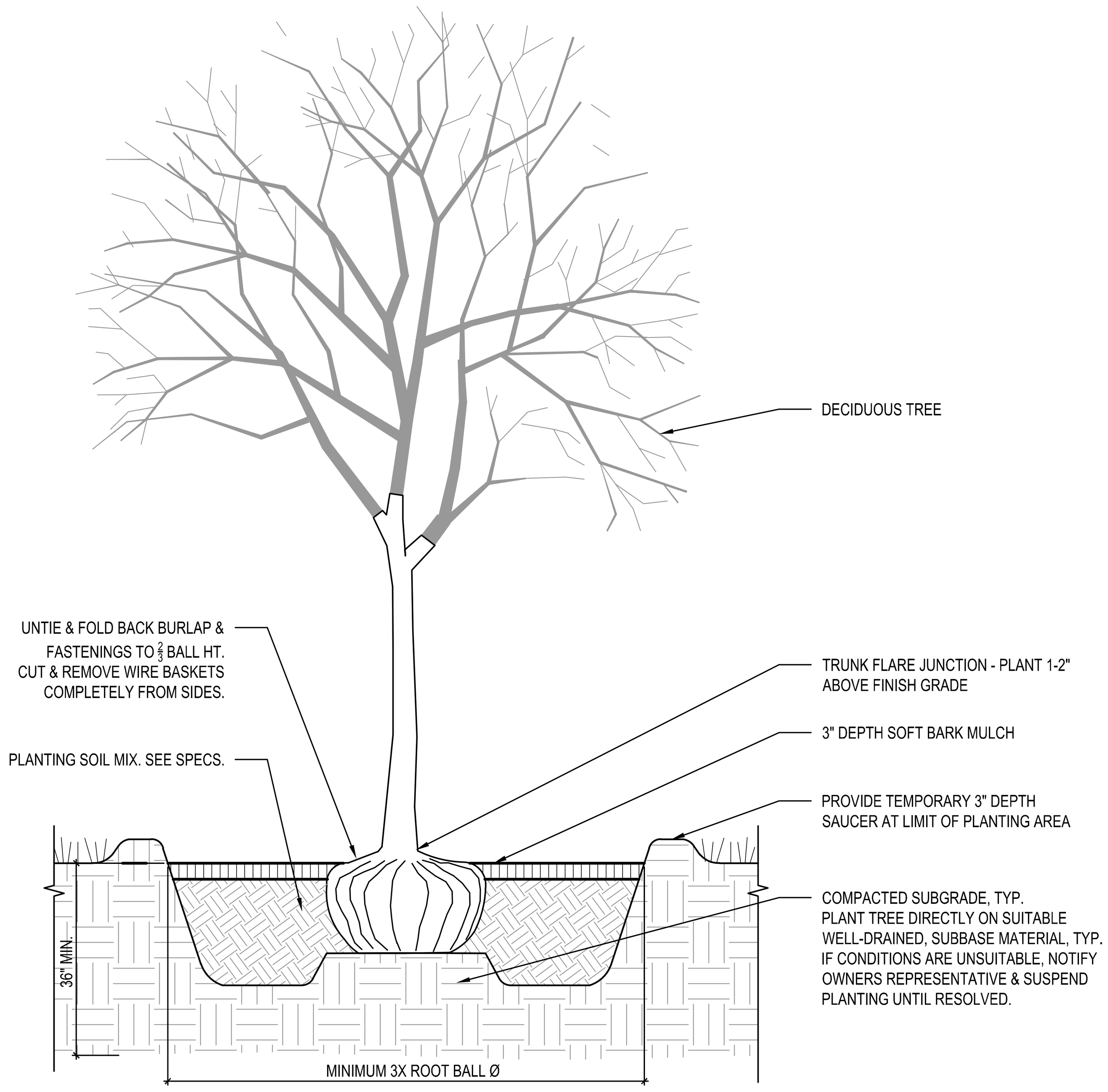
Drawing Title:

CONSTRUCTION DETAILS

Sheet Number:

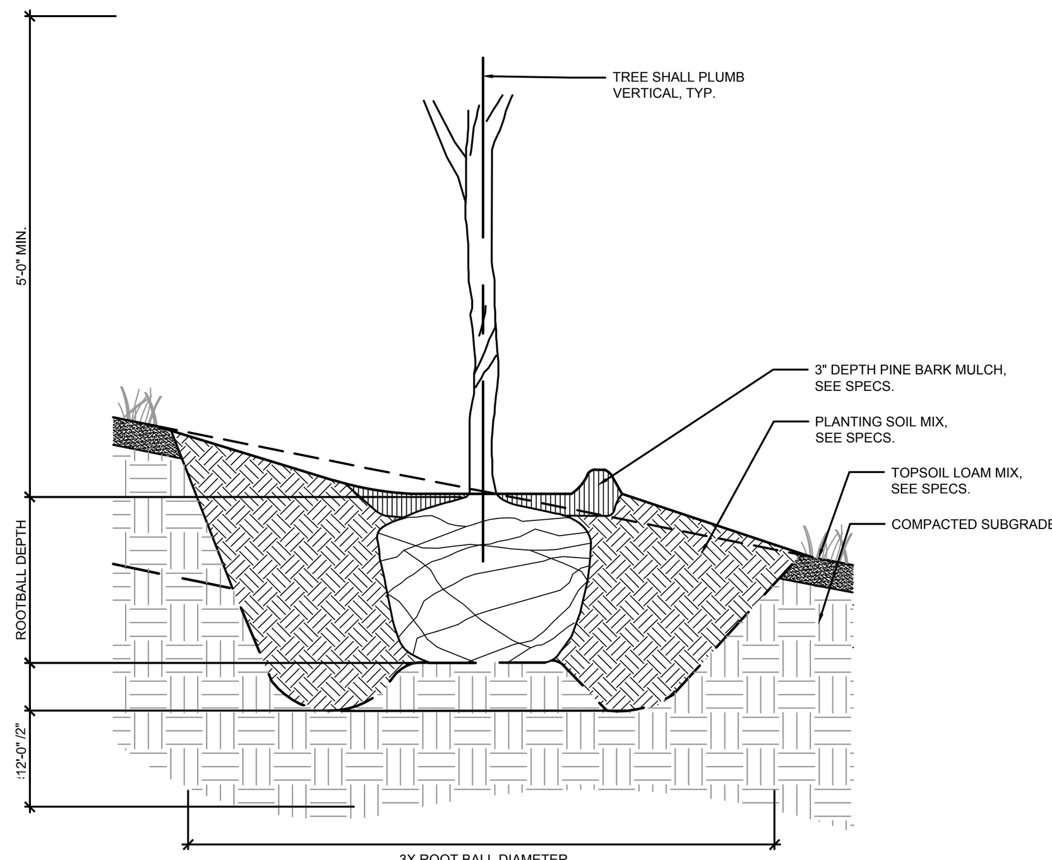
L505

P:\MA\Worcester MA\ENG22\01\Bell Pond Improvements\CAD\Sheet\L505.dwg



1 TREE PLANTING

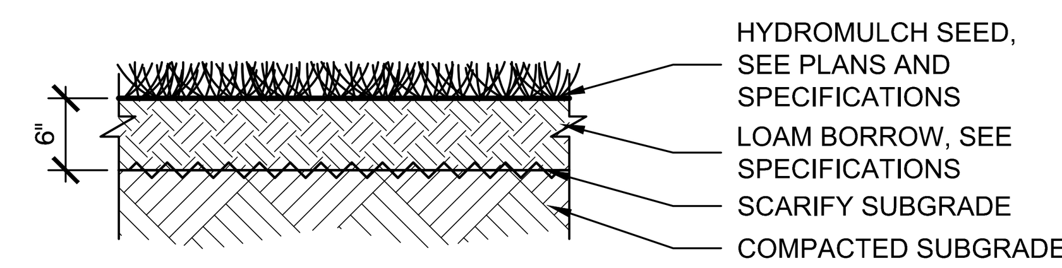
NOT TO SCALE



NOTES:
1. SCOPE VARIES. SEE GRADING PLANS. 3:1 MAX. SLOPE PLANTING. CONTRACTOR SHALL NOTIFY OWNER'S REPRESENTATIVE IF SLOPES ARE GREATER THAN 3:1.
2. OWNER'S REPRESENTATIVE AND CONTRACTOR SHALL MARK NORTH SIDE OF TREE AT NURSERY AND LOCATE TREE AT SAME ORIENTATION WHEN INSTALLING.
3. REMOVE 2/3 OF BURLAP WRAP AND WIRE BASKET OR TO THE GREATEST EXTENT POSSIBLE WITHOUT COMPROMISING THE STRUCTURAL INTEGRITY OF ROOTBALL.

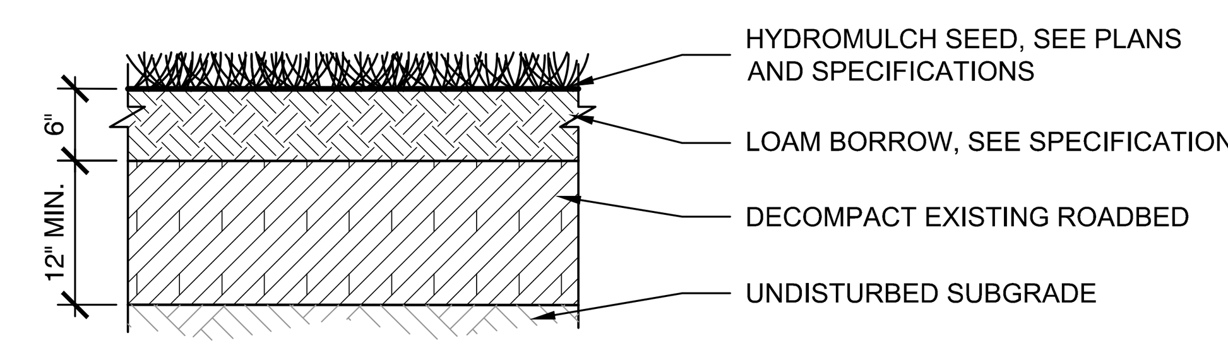
2 TREE PLANTING ON SLOPE

NOT TO SCALE



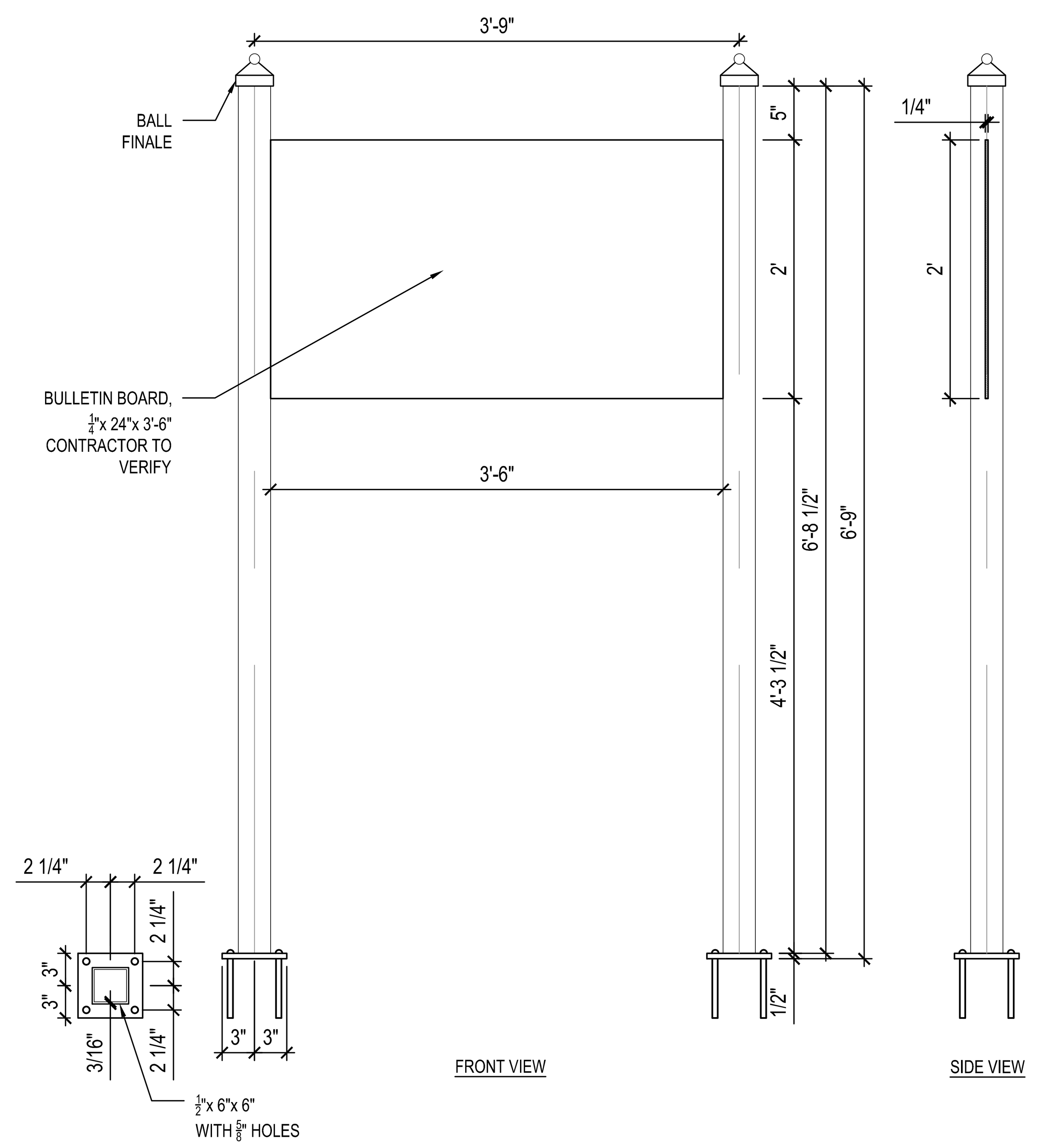
3 LOAM AND SEED MIX 1 - LAWN MIX

NOT TO SCALE



4 LOAM AND SEED MIX 2 - NATIVE GRASS MIX, SHADE TOLERANT

NOT TO SCALE



5 PARK SIGN

NOT TO SCALE

Project:
BELL POND PARK IMPROVEMENTS
WORCESTER, MA

196 BELMONT ST.
WORCESTER, MA 01605

Weston & Sampson

Weston & Sampson Engineers, Inc.
427 Main Street, Suite 400
Worcester, MA 01608
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:
NAULT ARCHITECTS INC.
71 Hope Avenue,
Worcester, MA 01603
508.755.6134
admin@naultarchitects.com

Revisions:

No.	Date	Description

COA:

Seal:

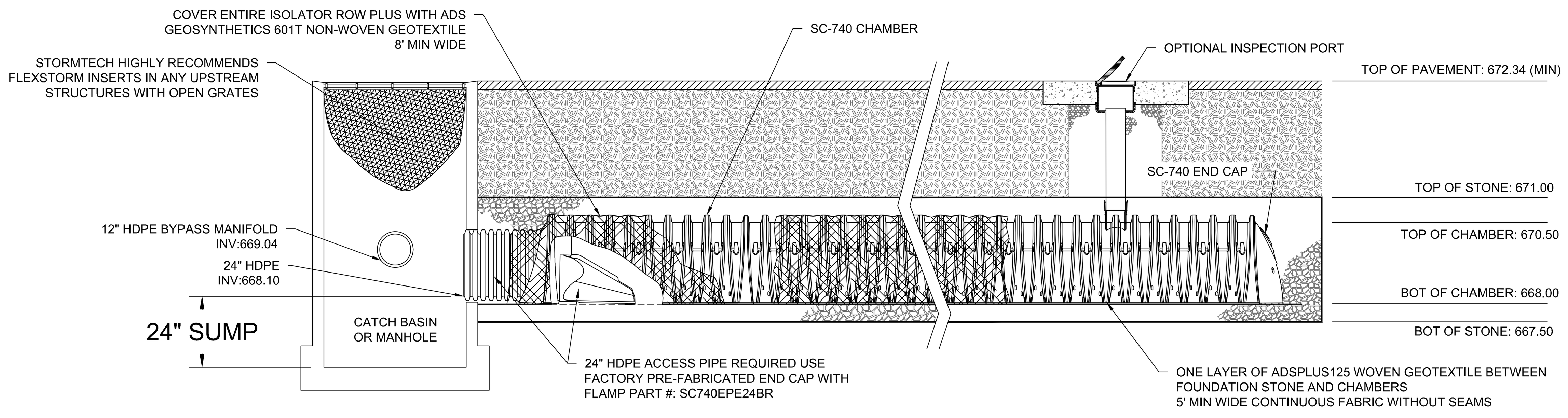
Issued For:
PERMIT SET
-NOT FOR CONSTRUCTION-

Scale: AS SHOWN

Date: March 22, 2023
Drawn By: TZ
Reviewed By: MS
Approved By: BK
W&S Project No.: ENG22-0194
W&S File No.:

Drawing Title:
CONSTRUCTION DETAILS

Sheet Number:
L506



3 STORMTECH SC-740 ISOLATOR ROW PLUS
SCALE: NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

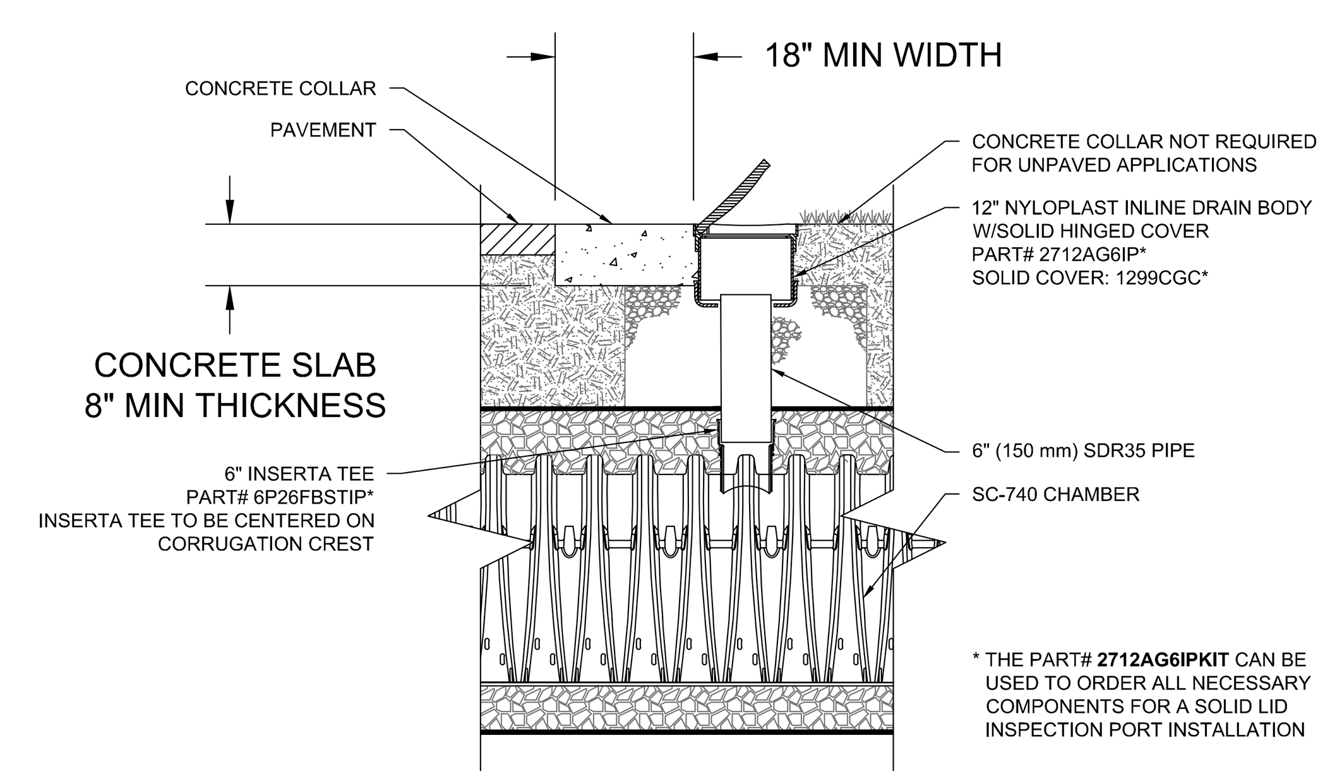
NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS. INSPECTIONS SHALL OCCUR ANNUALLY AT A MINIMUM.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

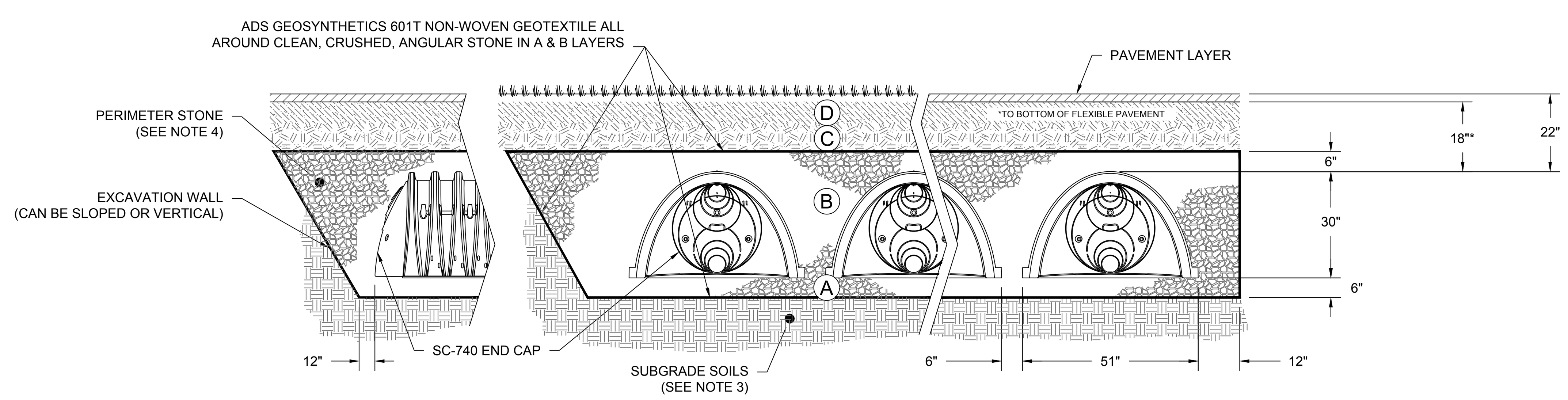
ACCEPTABLE FILL MATERIALS: STORMTECH SC-740 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER.	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



2 STORMTECH SC-740 INSPECTION PORT
SCALE: NTS



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-740 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 2".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 550 LBS/IN/IN. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
6. DETENTION SYSTEM IS TO BE SEALED AND LINED WITH A POLYVINYL LINER ALONG THE SIDES AND THE BOTTOM OF THE SYSTEM.

1 STORMTECH SC-740 CHAMBER SYSTEM
SCALE: NTS

1 CHAMBER
NOT TO SCALE

Project:
BELL POND PARK IMPROVEMENTS
WORCESTER, MA

196 BELMONT ST.
WORCESTER, MA 01605

Weston & Sampson
Weston & Sampson Engineers, Inc.
427 Main Street, Suite 400
Worcester, MA 01608
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:
NAULT ARCHITECTS INC.
71 Hope Avenue,
Worcester, MA 01603
508.755.6134
admin@naultarchitects.com

Revisions:

No.	Date	Description

COA:

Seal:

Issued For:
PERMIT SET
-NOT FOR CONSTRUCTION-

Scale: AS SHOWN

Date: March 22, 2023
Drawn By: TZ
Reviewed By: MS
Approved By: BK
W&S Project No.: ENG22-0194
W&S File No.:

Drawing Title:
CONSTRUCTION DETAILS

Sheet Number:
L507